BUREAU OF HYGIENE AND TROPICAL DISEASES

TROPICAL DISEASES BULLETIN

Vol. 50] 1953 [No. 5

SUMMARY OF RECENT ABSTRACTS*

IV. TRYPANOSOMIASIS

African Trypanosomiasis

General

The report for 1950–1951 of the Tsetse Fly and Trypanosomiasis Committee of the Colonial Office (p. 19) gives an account of the events which led to its formation, and of the work which was being done on animal and human problems in East and West Africa.

Morris (p. 21) discusses the ecology of trypanosomiasis. In West Africa man and tsetse tend to meet intensively in the neighbourhood of permanent water, and transmission may be so high that epidemic outbreaks occur, sometimes on a very large scale. The disease is not usually acute, and those who have it move about in the early stages, giving much opportunity of infecting the fly, whereas in East Africa the Rhodesian form is more severe, preventing much movement to the haunts of the more diffusely scattered *Glossina morsitans*. In West Africa pacification by European powers made travel much safer than it had been, and the Gambian form spread along trade routes, and along rivers, which form long, linear fly belts. In this essay, which should be read in full, the author takes into account the various features associated with location, which have a bearing on the ecology of the disease. The same author (p. 1102) discusses the effects of sleeping sickness on the population of the Northern Territories of the Gold Coast, and their development. An infection rate above 3 per cent. was enough to cause diminution in the population. The people would leave their villages in epidemic times, though they did not connect the disease with tsetse flies, and would temporarily overcrowd the healthy places. He discusses control and the problems it creates.

A focus of *Trypanosoma gambiense* infection involving over 200 cases in Africans near Kisumu is described by Davies (p. 1028).

Transmission

Maillot (p. 489) discusses the tsetse flies of French Equatorial Africa, and gives a map of their distribution, and Henrard (p. 847) the distribution of the 14 species found in the Belgian Congo.

* The information from which this series of summaries has been compiled is given in the abstracts which have appeared in the *Tropical Diseases Bulletin*, 1952, v. 49. References to the abstracts are given under the names of the authors quoted, and the pages on which the abstracts are printed.

LELEUP (p. 1029) has found *G. palpalis martinii* in banana plantations in part of the Belgian Congo where the surrounding country has been denuded of woody vegetation.

The mating scars on female *G. palpalis* have been studied by SQUIRE (p. 376) who points out that mating takes place very soon after emergence. He (p. 1029) has studied the sex ratio of *Glossina* [probably *palpalis*] in relation to age, finding that males predominate in all the older age-groups. He also shows that females which bear mating scars do not always contain spermatozoa, though previously it had been thought that after mating they remained fertile for the rest of life.

In experiments on humidity at constant temperature, PERTTUNEN (p. 759) shows that *G. palpalis* and *G. morsitans* preferred relative humidity of 27–50 per cent., but when kept unfed (and therefore suffering progressive desiccation) they moved towards fully saturated conditions when these were offered.

NASH (p. 759) has observed the resting habits of *G. medicorum*, *G. fusca*, and *G. morsitans*. *T. vivax* and *T. congolense* were found in *G. medicorum*.

Aetiology

CULWICK *et al.* (p. 23) have continued earlier work on the measurement of the polymorphic trypanosomes, and have found that mixtures of *T. brucei*, *T. rhodesiense* and *T. gambiense*, both *in vitro* and *in vivo*, result in trypanosomes significantly shorter than the parent strains. The authors attribute this to hybridization, and have noted that these strains (except the mixture *T. rhodesiense* and *T. gambiense*) tend to lose infectivity for man. They therefore argue that since the combination *T. brucei* with *T. rhodesiense* becomes less dangerous to man, it may be a mistake to exterminate game, which may carry them both and may in fact reduce the danger to man through this biological process. In comment, Hoare suggests that the phenomena attributed to hybridization may be due to competition or antagonism, which are known to occur between two parasites in a mixed infection.

HEISCH (p. 489) shows that under the laboratory conditions the African bush baby can become infected with *T. rhodesiense* by killing and eating infected rats.

LOEHNING and VAN BAAREN (p. 910) describe a method for staining trypanosomes in tissue sections.

Clinical Findings

T. gambiense infection acquired by blood transfusion is described by FERREIRA and ROSÁRIO (p. 490).

It has been suggested that adenitis is not a feature of *T. gambiense* infection in Europeans, but MONTESTRUC (p. 678) quotes instances to prove that it may be an early and valuable sign of the infection.

In sleeping sickness there is considerable reduction in serum cholesterol (MONNET and BAYLET, p. 604), and in the urinary secretion of 17-ketosteroids (in males only) (MONNET *et al.*, p. 1030).

A study of cold agglutinins in the blood in trypanosomiasis and malaria leads MARIENBERG (p. 26) to conclude that the reaction has no diagnostic value.

Treatment

GUIMARAES and LOURIE (p. 126) have shown that suramin inhibits some of the pharmacological actions of pentamidine, and has some antihistaminic action. They conclude that although the unpleasant effects of pentamidine are probably due to release of histamine, the inhibitory effects of suramin are probably not the result of its antihistaminic action, but are due to the

formation of an inactive salt complex with the amidine, though the antihistaminic action which suramin shows may contribute to some of the results.

JONCHÈRE (p. 490) has used lomidine on a large scale in treatment of the lymphatico-blood stage, but gives it only when the cerebrospinal fluid cell count is less than 5 per cmm., and protein less than 25 mgm. per 100 ml. There were many transient reactions, but delayed toxic effects were extremely rare. The dose was standardized at 4 mgm. of base per kgm. every 2 days for 5 injections, but a second course may be given. The failure rate was 6·1 per cent., but a note is made that CHAMBON believes that he has reduced his failure rate by delaying diagnostic lumbar puncture until 24 hours after the first (" sterilizing ") dose of the drug.

In experimental *T. gambiense* infection the curative dose of lomidine increases with the age of the infection (LAUNOY, p. 491).

The LD50 of melarsen oxide for mice has been stated as about 0·7 mgm. per 20 gm., and of Mel B 0·68 mgm. MONNET and BAYLET (p. 248) show that storage for 2 years and 1 year respectively did not affect these values significantly.

In the Final Report of the meeting of the International Scientific Committee for Trypanosomiasis Research held in French West Africa in 1951 (p. 240) several subjects are mentioned, but for readers of this *Bulletin* perhaps the most important were the resolutions which show that the trypanocidal power of Mel B and its ability to modify the cerebrospinal fluid have been confirmed, but it is too toxic for mass use in the bush. The optimal dosage for new cases in the nervous stage appears to be 10–12 mgm. per kgm. spread over 3 daily injections. It is necessary to establish biological standardization procedures for each of the melaminyl compounds. The diamidines are not toxic in doses up to 5 mgm. per kgm. of the di-isethionate intramuscularly each day for 10 days ; they are the best chemoprophylactic agents now in use.

In Ruanda-Urundi many of the cases of sleeping sickness are resistant to arsenic as a result of the widespread use of arsenicals in the past. VINCENT and LIÉTAR (p. 378) therefore used Mel B in treatment, with encouraging results in arsenic-resistant cases. It is not stated how many of these patients had received prophylactic pentamidine, widely used in the area. The need for thorough examination of all persons about to receive prophylactic pentamidine is stressed in comment by Lourie.

MONNET and BAYLET (p. 605) show that after intravenous injections of Mel B (3·6 mgm./kgm. daily) the drug can be detected in the cerebrospinal fluid within 24 hours of the third or fourth injection, but not after the first or second. The amounts detected are very small.

ERCOLI *et al.* (p. 249) discuss the relationship of BAL and various compounds active against trypanosome infections.

Terramycin is not effective in *T. gambiense* infection (PIRES and DE ALMEIDA, p. 492).

Drug Prophylaxis

Discussing prophylactic drugs used in part of the Belgian Congo CLAESSENS (p. 935) concludes that though Bayer 205 has given spectacular results, it may mask infection. Propamidine is useful, but pentamidine is the drug of choice. LE GAC (p. 245) gives an account of the control of sleeping sickness in Oubangui-Chari by prophylactic pentamidine and lomidine. The campaigns were remarkably successful. In a long paper LOTTE (p. 246) discusses chemoprophylaxis with pentamidine, noting the different results to be expected in the varying epidemiological circumstances, which include the prevalence of the disease and extraneous conditions such as movements of the people. He emphasizes the need for careful examination of the people so that those already infected may receive full curative treatment, and not merely a

prophylactic injection which may be enough to mask the disease but not to cure it, and which may therefore do these people serious disservice. Observing that pentamidine should be repeated at intervals of 6 months (not 12) he concludes that it is capable of completely clearing an infected area, but that strict rules must be observed if success is to be achieved ; *everybody* must be injected in the area concerned.

Baudart (p. 377) writes of the history of sleeping sickness in Ruanda-Urundi, where medical reports in 1910 spoke of extermination of the lake-shore population. Systematic treatment and resettlement above 3,000 feet did much to reduce incidence, but an outbreak in 1944 led to the use of prophylactic pentamidine, repeated every 6 months. Considerable reduction took place but eradication has not been achieved, and, as Lourie points out in comment, cannot be achieved in an area subject to reinfection from outside unless the prophylactic operations extend far into the country from which it is imported.

Control

McLetchie (p. 243) reports on the sleeping sickness service in Nigeria, which is administered jointly with the Medical Field Units. The numbers of new cases of sleeping sickness discovered have fallen to the lowest figure since 1931, and it appears that there is a decline of an epidemic era of perhaps 20 years. The proportion of relapsed and refractory cases, however, shows a disconcerting tendency to rise, possibly as a result of elimination of all but the most resistant strains by mass treatment. Clearing and development work continues in various areas, and the author gives details of costs and techniques. The Medical Field Units deal with the great endemic and epidemic diseases, including malaria, schistosomiasis, paragonimiasis, epidemic cerebrospinal fever, undernourishment and smallpox, and they have begun to collect vital statistics. The training of the dressers to staff these Units is discussed in this important report.

Akwei (p. 1032) shows that after 10 years of anti-tsetse measures and treatment of infected persons in part of the Gold Coast, trypanosomiasis has ceased to be a public health problem.

From a small uninhabited island in Lake Victoria *G. palpalis* was completely cleared by applying DDT solution to its feeding grounds, especially rocks frequented by crocodiles. Steyn (p. 677) states that this area was only 3 per cent. of the island.

Glasgow and Duffy (p. 125) report the failure of an attempt to clear of *G. palpalis fuscipes* by hand-catching an isolated block of riverine forest, in Kenya, though a belt treated in the same way some years ago has remained free from the fly. It became evident that flies were crossing the considerable clearings made to isolate this block of forest.

In the Sudan the relationship between *G. palpalis* and the siting of villages near water has been recognized, and Lewis (p. 376) shows that large numbers of people have been resettled in dispersed villages. Sleeping sickness is now controlled by inspection and treatment, and is not now so urgent a problem. More attention is being paid to *G. morsitans*, the main vector of animal trypanosomes.

In Tanganyika 39 different schemes for the control of tsetse by clearing of bush have been initiated, and the Annual Report of the Tsetse Survey and Reclamation Department (p. 675) describes them and illustrates them in a series of maps. Some have been completed, but in others there have been difficulties. The schemes were organized to protect towns, grazing grounds, farms or roads, or to reclaim territory and re-settle the people, or to limit the spread of *T. rhodesiense* infection. *Glossina morsitans* was the fly chiefly concerned. From Tanganyika Potts and Jackson (p. 1030) describe

in detail the game destruction experiment carried out during 1945–1950 in an area of bush country some 600 square miles in extent. This land was isolated by open grass country, or by cultivation, and was therefore protected from invading tsetse and game, but for the latter it was necessary to erect a fence 50 miles long. The animals known to be shot numbered 8,554. Results of fly catches suggest that *G. morsitans* and *G. swynnertoni* were exterminated and that *G. pallidipes* either became very rare, or was perhaps exterminated. The cost was £50 per square mile, which was considerably less than the cost of effective discriminative clearing, but the cost would have been greatly increased if the area had not been naturally isolated. This method of control is not suitable except for isolated belts of manageable size, and the authors think that discriminative clearing, though initially more expensive, is to be preferred ; after such clearing " at least some decades are likely to pass before the flies can return ".

Mossop (p. 676) and Whellan (p. 676) describe the tsetse fly position in S. Rhodesia, where *G. morsitans* is combated by a barrier belt of controlled game destruction and where clearing is used in certain places for control of *G. pallidipes* and *G. brevipalpis*.

Fiedler (p. 1103) describes the measures taken against tsetse flies in Zululand, which include the use of insecticides from aircraft or as smokes from ground appliances, and bush clearing and game destruction.

Trypanosomiasis of Animals

Spena (p. 379) writes of bovine trypanosomiasis in Abyssinia.

The International Committee for Trypanosomiasis Research appointed a sub-committee to report on the use of antrycide and dimidium bromide in animal trypanosomiasis (p. 242). Treatment and prophylaxis are considered.

Lourie and Walker (p. 250) show that the toxicity of antrycide methylsulphate in mice depends to a considerable degree on the amount of fluid in which the drug is given ; the same dose is more toxic in small than in large amounts of fluid.

Lourie *et al.* (p. 250) describe a cinnoline compound which may be useful in *T. congolense* infections.

A study of the flagellum of *T. brucei* by electron microscopy is reported by Kleinschmidt and Schleich (p. 124).

Papers on *T. vivax* have been contributed by Tate (p. 22), Squire (p. 26), and Desowitz and Watson (p. 936) ; on *T. evansi* by Kraneveld *et al.* (p. 848) ; on *T. equiperdum* by Tobie (p. 848) ; and on *T. lewisi* by Ryley (p. 129) and Eyles (p. 936).

American Trypanosomiasis

Chagas's Disease

Epidemiology : Transmission

Considerable evidence of Chagas's disease has been found in part of Brazil by Pedreira de Freitas and Mendonça (p. 27) ; in Argentina by Romaña and Kirschbaum (p. 380) (who confirm the association with heart disease) and by Briones (p. 381).

A monograph on the triatomid bugs of Argentina has been published by Abalos and Wygodzinsky (p. 606) ; 17 species of 4 genera are found. The infection rate for bugs in part of Brazil was 7·8 per cent. (Forattini and da Silva, p. 27) but higher rates were found in Minas Gerais by Pellegrino (p. 494) in *Panstrongylus megistus*, *Triatoma infestans* and *T. sordida*. In part of São Paulo *P. megistus* is a secondary vector, however (Corrêa and Schiavi, p. 494).

After the application of nymphs of *T. infestans* to infected persons or animals, *T. cruzi* is found in 80 per cent. some 30–89 days later (THIERMANN, p. 495).

RYCKMAN (p. 937) describes the rearing of Triatominae in the laboratory.

Aetiology

ELKELES (p. 126) discusses the life cycle of *T. cruzi*. His views, which are critically reviewed by Hoare, should be sought in the original.

Media for the cultivation of *T. cruzi* are described by LITTLE and OLESON (p. 493). Investigating the importance of blood derivatives for the growth of a strain of *T. cruzi*, MCRARY *et al.* (p. 937) conclude that a moderately complex derivative of haemoglobin is the only essential growth factor, when peptone, glucose and NaCl are present.

Clinical Findings : Treatment : Control

Cortisone masks the symptoms of *T. cruzi* infection in mice (AGOSIN *et al.*, p. 849), but with its aid SENECA and ROCKENBACH (p. 1033) have succeeded in producing fatal infections in baby white rats. Somewhat similar work is reported by NEGHME *et al.* (p. 1104). CHRISTEN *et al.* (p. 128) show that pentaquine phosphate alone and together with quinine sulphate had some therapeutic action in experimental *T. cruzi* infection. This action, however, was insufficient to control the unfavourable action of cortisone (JARPA *et al.*, p. 128).

ROMAÑA and DE MONDOLFO (p. 381) produce experimental evidence that injected *T. cruzi* spread long lymph channels causing lesions in them and in the glands.

PEDREIRA DE FREITAS (p. 606) describes the technique of the complement-fixation test for Chagas's disease, which is positive in most chronic cases, and is apparently rarely positive in other diseases uncomplicated by *T. cruzi*. It is not useful in acute Chagas's disease. To preserve the antigen for the complement-fixation test, he (p. 127) desiccates the cultures at low temperature and keeps them *in vacuo* in sealed ampoules, either at −30°C., or near +5°C. PELLEGRINO *et al.* (p. 678) report that certain persons who volunteered as blood donors in Brazil had positive complement-fixation tests for Chagas's disease, and even positive xenodiagnosis, and they emphasize the importance of such tests.

A study of heterophile antibodies in Chagas's disease is reported by DE GÓES and LOBO (p. 607).

PÉRA (p. 495) discusses the diagnosis of heart disease in relation to Chagas's disease. The chief disturbances are irregularity due to extra systole, and to heart block.

BRASIL (p. 251) has investigated the bradycardia of Chagas's disease, which he thinks is due to depression of the sino-auricular node. This explains many of the cardiac phenomena, including sudden death.

In examination of a number of 8-aminoquinolines against *T. cruzi* infections of mice, GOBLE (p. 938) found pentaquine, isopentaquine and primaquine most active. Therapeutic trials in man are indicated ; these three substances are all active in malaria. Primaquine exerts a strong suppressive action in the early stages of *T. cruzi* infection of mice (PIZZI, p. 382).

Experiments conducted *in vitro* by BETTINOTTI (p. 127) indicate that antibiotics have an action on *T. cruzi* only in concentrations higher than those normally reached in the blood.

GALLIARD and BOUTET (p. 1034) show that when Reduviid bugs already infected with *T. cruzi* were fed on mice previously treated with Bayer 7602, lomidine or chloroquine, there was temporary decrease in metacyclic trypanosomes in their guts, but they were not sterilized.

A remarkable reduction in the numbers of *Triatoma infestans* found in houses which had been treated with BHC is reported, from a focus of Chagas's disease in Brazil, by PELLEGRINO and BRENER (p. 1034), and UNTI and DA SILVA (p. 605) also report favourably on BHC.

OTHER TRYPANOSOMIASES

In a group of papers on trypanosomiasis in Venezuela TORREALBA (p. 380) mentions cases of infection with *T. rangeli*, noting that this may co-exist with Chagas's disease, and that *Rhodnius prolixus* has been found infected.

A new trypanosome, named *T. ariarii*, has been found in man in Colombia, where 67 of 183 persons were infected with it. GROOT *et al.* (p. 760) have cultivated it from blood, and show that it develops readily in *Rhodnius prolixus*. Certain animals can be infected artificially, and natural infection has been observed in a dog and a monkey. The trypanosome differs from *T. cruzi*, but its relationship to *T. rangeli* is not so clear.

Charles Wilcocks

MALARIA

CHARLES, L. J. **Malaria in the Leeward and Windward Islands, British West Indies.** *Amer. J. Trop. Med. & Hyg.* 1952, Nov., v. 1, No. 6, 941–61, 7 figs. [26 refs.]

A malaria survey has been made of the Windward (Grenada, St. Vincent, St. Lucia and Dominica) and Leeward (Antigua, Nevis, Montserrat and St. Kitts) Islands which lie between Porto Rico and Trinidad from 17° to 10°N. Data are presented in the form of tables giving : vital statistics, economic information, morbidity and mortality rates, spleen and parasite rates, degree of splenic enlargement, the association of splenic enlargement with parasite findings, relative frequency of parasite species and results of anopheline larval collections ; they are elaborated by a statement for each island illustrated in some case, by a map. The islands are mountainous ; the temperature is equable, and rains seasonal and heavy. On the basis of past findings and circumstantial evidence *Anopheles aquasalis* is believed to be the vector, possibly reinforced by *A. albimanus* in the Leeward Islands. Grenada, St. Lucia, Dominica and Antigua are relatively the more malarious with parasite rates of 8·7, 12·9, 10·4 and 7·8 per cent. respectively. Nevis, St. Vincent and St. Kitts were very slightly malarious at the time of survey with parasite rates of 1·9, 0·0 (but a spleen rate of 0·7), and 2·2 per cent. ; Montserrat is regarded as normally non-malarious, though it suffered a marked epidemic in 1938–39 ; 25 blood films were examined and all found negative. *Plasmodium falciparum* and *P. malariae* are present in notable amount, the former predominating in the more malarious islands. *P. vivax*, which is relatively rare, constituted only 1·7 per cent. of the positive films and is believed to be totally absent from Antigua.

The climate makes transmission perennially possible though local factors produce intermissions. Considerable fluctuations in incidence between 1933 and 1942 appear in the morbidity and mortality tables, and are most marked in Montserrat, St. Vincent and Antigua. Epidemics are referred to in the text.

On the basis of these findings and analogy with Trinidad and Porto Rico it is concluded that residual insecticide spraying of the endemic foci should control malaria. *G. Macdonald*

See also p. 459, ANSCHAU & EXNER, Faunistische und ökologische Untersuchungen an steirischen Culiciden. [**Faunistic and Ecological Investigations on the Culicidae of Styria**]

GRJEBINE, Alexis. Les moustiques des régions de Bouar et de Bozoum (Oubangui-Chari). [**Mosquitoes of Bouar and Bozoum (Oubangui-Chari)**] *Bull. Inst. d'Études Centrafricaines.* (n.s.) 1952, No. 4, 151–80, 4 figs.

A mosquito survey was made towards the end of the dry season in 1950 (March, April and May) in and around Bouar in the south west of Ubangui-Chari ; brief visits were also paid to Bozoum, about 70 miles to the north-east of Bouar, and to Moundou on the River Lagone in Chad. The species of mosquitoes collected at each place are listed.

The report is mainly of local interest and is mostly concerned with Bouar, but a few points are of general interest. For example, at the time of the survey *Anopheles funestus* was the dominant domestic anopheline, though *A. gambiae* was present in smaller numbers as well. Others present were *A. hargreavesi*, *A. hancocki*, *A. maculipalpis*, *A. rufipes*, *A. longipalpis* and, at Bozoum only, *A. squamosus*. *A coustani ziemanni* was taken at each place. In addition there were several species of culicines. Minimum temperatures were too low for *Plasmodium falciparum* and permitted only the continued development in the anopheline of *P. vivax*. A few insecticide trials were made with DDT but because the visit was too brief it was not possible to observe the duration of the residual effect in houses. *H. S. Leeson*

BERNET, A. Contribution à l'étude de la biologie des anophèles en A.O.F. Remarques sur le vol des anophèles. [**Study of the Biology of Anophelines in French West Africa. Observations on the Flight of Anophelines**] *Méd. Trop.* Marseilles. 1952, Nov.–Dec., v. 12, No. 6, 676–87.

The author divides the species of *Anopheles* occurring in French West Africa into two categories, namely, those with powerful flight and those with weaker flight. Flight power he regards as a function of wing-size, thus there are larger species and smaller species.

The larger species are those anophelines which are 5 mm. or more in length and include *A. pharoensis*, *A. coustani* and *A. gambiae* (de grande taille). These species are powerful fliers and have the ability to fly high and direct from place to place, to be able to withstand air-currents and to travel long distances. Their normal haunts are seldom frequented by man, consequently they are feeble vectors of malaria in nature or at the most are only of local importance.

On the other hand, the important vectors are the smaller species, those of 4 mm. or less in length. Those occurring in French West Africa are *A. gambiae* (which the author refers to as *A. gambiae minor*) and *A. funestus* and they possess a less powerful flight than the larger species. They fly low, generally below 20 cm. above a horizontal surface and they fly erratically, for short distances only, they need frequent rests and are readily affected by air-currents. As a result they are more easily captured than the larger species and are more susceptible to insecticide sprays.

These and other activities of the smaller anophelines are described, firstly in relation to " progression ", which is defined as the main flight of the mosquito from the breeding place to the feeding place ; then secondly, in relation to " dispersion " which is defined as the movements of the mosquitoes inside the feeding area, and thirdly in relation to the epidemiology of malaria.

Although the author's observations refer particularly to the flight of certain anophelines of French West Africa, he thinks it is quite likely that they will be

found to apply equally well to the anophelines of other parts of the continent and perhaps to the culicine mosquitoes also.

[No experimental evidence is presented or quoted in support of any of the statements made, and only one reference is given to the literature ; but the paper contains some interesting ideas which stimulate thought and may perhaps suggest the necessity for more controlled investigation into the factors which influence the flight of mosquitoes.] *H. S. Leeson*

KRISHNASWAMI, A. K. **A Note on the Nocturnal Behaviour of *A. minimus* Theobald, 1901, in DDT-Sprayed Huts in North Bengal.** *Indian J. Malariology.* 1952, Mar., v. 6, No. 1, 117–22, 2 charts.

The data here published were obtained during the course of an investigation, in 1945, of the efficacy of indoor spraying with DDT in the control of malaria transmitted by *A. minimus*. Collections of mosquitoes were made in 8 labourers' huts which had been sprayed with DDT. At two-hour intervals through the night, for a total of 12 nights, all mosquitoes seen were collected, identified, and their abdominal condition recorded as unfed ("flat"), "half fed", "full fed", or "with digested blood". The collections were made at odd and even hours on alternate nights, and the data from these two series are tabulated separately. It was found that most of the unfed mosquitoes were entering huts between 22.00 hours and 24.00 hours, while most of the fully fed specimens were found after midnight. The incidence of malaria was reduced as a result of the DDT spraying, and the sporozoite rate in *A. minimus* from sprayed huts is reported to be markedly lower than in those from unsprayed huts. No information is given by the author as to the survival of *A. minimus* in treated huts, but he quotes other workers to the effect that this mosquito rests long enough on treated surfaces to pick up a lethal dose.

A. J. P. Goodchild

RYCKMAN, R. E. & ARAKAWA, K. Y. *Anopheles freeborni* **hibernating in Wood Rats' Nests (Diptera : Culicidae).** Reprinted from *Pan-Pacific Entomologist.* 1951, v. 27, No. 4, 172.

This is an interesting observation of adult female and male *Anopheles freeborni* found in California at rest in the nests of wood rats (*Neotoma fuscipes*). This was observed on 4 different occasions ; the number of mosquitoes varied from 9 to about 20, mainly females. In the case of 3 nests the nearest breeding place was 150 yards away, and the nearest cattle were 300 yards off. Although 2 females contained some recent blood and most of the others were "plump" (but not from blood) it was not established that they were feeding on the wood rats. This resting place seems, however, to be a true hibernating place.

D. S. Bertram

DOWNS, W. G. & ARIZMENDI, A. Colonización de varias especies de anofelinos mexicanos. [**Rearing Colonies of Various Species of Mexican Anophelines**] *Rev. Inst. Salubridad y Enfermedades Trop.* Mexico. 1951, Jan.–Dec., v. 12, Nos. 1/4, 21–6.

This is a brief account of results obtained in rearing colonies of several mosquito species of Mexico in the laboratory. Four rooms, 3 metres × 3 metres [height ?] and with double windows and doors, were used as insectaries. Electrical heaters provided mean temperatures of 23°C. (22°–25°C.) or 28°C. (26°–31°C.) ; relative humidities between 70 per cent. and 85 per cent. were maintained by fans blowing across porous bricks standing in water near the heaters. Light intensity was kept low. The adult mosquitoes were accommodated in cubic cages of 90 cm. and fed usually on guineapigs or rabbits,

with additional access to 5 per cent. honey solution or sugar. Dishes of water were provided for oviposition and also a dish of moist sand surmounted by a cylinder of baked mud (4 cm. × 30 cm. high) to provide a humid retreat for the adults if required. Larval dishes were shallow and 25 cm. × 35 cm. in area. After the second instar, about 150–200 larvae were kept in a single dish. Early stages of the larvae were fed with a few drops of heart-brain infusion and, later, the dishes were sprinkled with a powdered food consisting of 1 part dried Corixidae (water bugs), 1 part dog biscuit, 1 part dried fish and 1 part dried alfalfa.

A laboratory strain of *A. quadrimaculatus* from the U.S. National Institute of Health bred successfully, but not local material collected in the field in Mexico. *A. albimanus* was maintained satisfactorily at 28°C., but, at 24°C., much fat body was laid down and few eggs were laid. *A. aztecus* has been kept continuously for several years. The adults are not robust, and mortality in the larva stage and at the emergence of the adults is considerable. Originally, human hosts were necessary but the females now feed on guineapig and rabbit. *A. pseudopunctipennis*, *A. vestitipennis*, and *A. crucians* failed to breed in captivity ; fertilization did not take place in the first two species.

Aëdes aegypti and *Culex fatigans* bred easily. *D. S. Bertram*

Bordas, E., Navarro, L. & Downs, W. G. Estudio comparativo de los hábitos del adulto de tres especies de *Anopheles* mexicanos. [**Comparative Study of the Habits of Three Species of Mexican Anophelines**] *Rev. Inst. Salubridad y Enfermedades Trop.* Mexico. 1951, Jan.–Dec., v. 12, Nos. 1/4, 35–8.

Brief notes on the biology of *Anopheles aztecus*, *A.p. pseudopunctipennis*, and *A. albimanus* in Mexico.

The female of *A. aztecus* is domestic in habit, remaining in houses to develop its eggs after taking a blood meal ; males are rarely seen indoors and their resting places are little known. The density of this species was low in the area studied. *A.p. pseudopunctipennis* is a malaria vector in the semi-arid subtropical parts of Mexico. Newly emerged females enter and rest in houses until dusk when they go out again to mate and feed. They then return to rest indoors for about 4 days while their eggs develop. A house-catch consists of males, young females, and others with different degrees of ovarian development. *A. albimanus* is the vector of malaria along the coast and in the valleys of the great rivers. It is less anthropophilic than the other two species. It has peaks of activity at dawn and at dusk, entering houses to feed, but not frequently resting in the room where it feeds. It appears to prefer sheds, corridors, verandahs, trees and bushes, but its movements and selection of sites are not known in detail.

The control of these species, and of malaria, by residual sprays of DDT in houses is briefly considered. Both *A. aztecus* and *A. pseudopunctipennis* have been effectively controlled and, in the latter case, with an accompanying decline in the incidence of malaria. It seems unlikely from its habits that the method can eradicate *A. albimanus*, but control may be sufficient to reduce malaria transmission. *D. S. Bertram*

Muirhead-Thomson, R. C. & Mercier, E. C. **Factors in Malaria Transmission by *Anopheles albimanus* in Jamaica. Part II.** *Ann. Trop. Med. & Parasit.* 1952, Nov., v. 46, No. 3, 201–13.

Anopheles albimanus is the predominant anopheline mosquito in Jamaica and is generally accredited to be the vector of malaria in these parts although,

in earlier work [this *Bulletin*, 1930, v. 27, 193] and the present studies, gland infections in wild-caught specimens have never, or only rarely, been found. Studies of the vector and of the incidence of malaria were, in the present work, carried out in 3 areas near Kingston—Ferry-Caymanas, Bull Bay and Grants Pen. Parasite rates (in 532 persons) for *P. falciparum* and *P. malariae* (*P. vivax* was rare) are tabulated for children under 2, and the age-groups 2–6 years, 7–14 years, 15 years and over. The overall percentages, infected in these groups were : *P. falciparum*, 23·2, 20·6, 22·8 and 13·7 ; *P. malariae*, nil, 9·1, 9·5 and 4·0 Gametocyte carriers among those infected were, for *P. falciparum*, 18·3, 5·7, 7·6 and 4·0 per cent. for each age-group ; for *P. malariae* corresponding percentages were nil, 5·7, 8·1 and 3·4 per cent. Further details indicate an increase in the incidence of these parasites in the colder rainy season. The gametocyte rate for *P. falciparum* also increased, but this was not apparent for *P. malariae*. Nearly 3,000 *A. albimanus* and 73 *A. grabhami* were negative for sporozoites ; most were taken on human bait or in window-traps in houses, although some were taken on cow or donkey bait. The authors note that these negative results may be a result of sampling an inadequate or unrepresentative part of the total mosquito population by restricting catches mainly to sundown. The paper then goes on to describe and discuss the malaria incidence in the human population, the breeding facilities for the vector and other factors influencing the epidemiology of malaria in each of the three areas investigated.

Finally, the selective biting habits of *A. albimanus* on people of different age, the incidence of parasitaemia and of gametocytes in different age-groups, and the infectivity of different gametocyte-carriers, are discussed. The most infectious carriers—all 3 years old or less—are not as frequently fed on by the mosquito as older persons. Two adult gametocyte-carriers, one of whom had the highest gametocyte density observed, did not infect mosquitoes fed on them. This may be complicated by self-treatment with drugs. Children in the 7–14 age-group were attractive to mosquitoes and infected them successfully in tests. This seems to be an important age-group as a reservoir of malaria infection for the mosquitoes ; a rise, in this group, of the gametocyte-rate from 3 to 24 per cent. was noted in one of the areas at the beginning of the malaria season. [For Part I, see this *Bulletin*, 1953, v. 50, 275.]

D. S. Bertram

See also p. 460, GRIFFITHS & GORDON, **An Apparatus which enables the Process of feeding by Mosquitoes to be observed in the Tissues of a Live Rodent ; together with an Account of the Ejection of Saliva and its Significance in Malaria.**

PEREZ-PINA, F., HARTNEY, J. B. & ZIMMERMAN, S. L. **Rupture of Spleen in Patient with Malaria.** *U.S. Armed Forces Med. J.* 1953, Jan., v. 4, No. 1, 149–54, 2 figs.

Report of a case.

GOODWIN, L. G. **The Chemotherapy of Malaria and Trypanosomiasis.** *Brit. Med. J.* 1953, Feb. 7, 311–13. [23 refs.]

This paper, which was read at the Section of Tropical Medicine at the Joint Annual Meeting of the British Medical Association and Irish Medical Association in 1952, is a useful summary of the present position and of recent work. Most of it will be familiar to readers of this *Bulletin*. One point, perhaps, merits special mention, namely that proguanil by itself exerts little activity upon

malaria parasites *in vitro*, but serum from an animal treated with proguanil is active. This is due to a metabolite formed by the cyclization of the biguanide chain of proguanil to form a diamino-dihydrotriazine derivative, which is about 100 times as active as the parent substance in laboratory malaria infections. The introduction of a second chlorine atom into proguanil or into the triazine derivatives produces even more active compounds: these are undergoing clinical trial. *Philip Manson-Bahr*

Pastor Botija, F. Un caso de paludismo por " Pl. falciparum " resistente a la quinacrina y a la quinina, tratado y curado con nivaquine. Nota clinica. [**A Case of *P. falciparum* Malaria Resistant to Mepacrine and Quinine Cured by Nivaquine**] *Med. Colonial.* Madrid. 1952, Nov. 1, v. 20, No. 5, 407–13.

Srinivas, K. S., Guha, S. S. & Guha, P. C. **Studies in Synthetic Antimalarials. Part XX. Some Sulphabiguanide Derivatives.** *J. Indian Inst. Sci.* 1953, Jan., v. 35, No. 1, 47–54. [11 refs.]

Love, J., Foulk, R., Williams, R. G. W., Jr. & Mitchell, R. B. **Evaluation of Amodiaquin (Camoquin) in the Treatment of Relapsing Vivax Malaria.** *Amer. J. Med. Sci.* 1953, Jan., v. 225, No. 1, 26–33, 3 figs. [21 refs.]

One hundred patients suffering from relapsing *P. vivax* malaria, almost all of whom had recently returned from Korea, were treated with a single dose of 10 mgm./kgm. body weight of camoquin, which is equivalent to 600 to 800 mgm. or 3 to 4 tablets of the drug for each case. The time interval between leaving Korea and the first symptoms of malaria varied from 2 weeks to 11 months. Seventy-five per cent. of the patients had undergone suppressive therapy with 0·5 gm. chloroquine once weekly while in the malarial zone.

Clinical symptoms were controlled in 24 to 48 hours, the temperature returned to normal on an average in 22·5 hours, and demonstrable parasitaemia disappeared in 30 hours in the first, and in 21·5 hours in second relapses. Apart from mild nausea and vomiting in 6 per cent. of cases, no toxic effect of the drug was noticed. The relapse rate after camoquin treatment was 20 per cent.; 3 per cent. of patients relapsed twice and one had a third and a fourth relapse, the last one occurring despite treatment with 15 mgm./kgm. body weight.

The authors claim that camoquin has the advantage over chloroquine of being effective in a single dose, whereas the recommended therapeutic dosage of chloroquine is 2·5 gm. given over a 3-day period. They consider chloroquine in 0·5 gm. dosage once weekly to be the best drug for suppression, but state that when used therapeutically in 2·5 gm. dosage over a 3-day period (as reported by other observers) it is followed by a much higher relapse rate than is a single dose of camoquin.

[The conclusions drawn as to the relative efficacy of camoquin and chloroquine would have been more impressive had alternate cases in the series been treated with a single dose of the latter drug.] *G. Covell*

i. J. Amer. Med. Ass. 1952, Aug. 23, v. 149, No. 17, 1558–70, 10 figs. [Refs. in footnotes.] **Status of Primaquine.** [4 Reports published by Authority of Council on Pharmacy and Chemistry.]

ii. ——, 1573. **Primaquine for Vivax Malaria.** [Editorial.]

i. Apart from the discovery of a causal prophylactic of low toxicity the most important present necessity in malarial therapy is an effective means of overcoming relapses in *P. vivax* malaria. This series of 4 papers, published under

the auspices of the Council on Pharmacy and Chemistry of the American Medical Association, is concerned with the evaluation of a new compound in the 8-aminoquinoline group of drugs : Primaquine, 8-(4-amino-1-methylbutylamino)-6-methoxyquinoline, first synthesized at Columbia University during World War II. All doses quoted here are in amounts of the base.

With the return of troops from Korea, where chloroquine had been used effectively as a suppressive, many relapses of *P. vivax* malaria occurred. The strain of parasite is one having a latent period of 8 or 9 months before the first relapse. Primaquine, 15 mgm. daily for 14 days, was given to homeward-bound troops leaving Korea, and the toxic effects and possible influence on motion sickness were assessed. It was shown that this dosage could be given safely without special medical supervision and that no increased gastro-intestinal upset occurred than that expected from motion sickness.

In evaluating the therapeutic efficiency of the drug, troops suffering from proved *P. vivax* malaria were treated in 3 groups and followed up for 4 to 11 months. Of 232 men who had a standard course of chloroquine of 1·5 gm. in divided doses over 3 days and were adequately followed, 64 (27 per cent.) relapsed. A second group of 246 men had the same course of chloroquine together with pamaquin 27 mgm. base daily in 3 equal doses for 14 days. Of these 1 (0·4 per cent.) relapsed. Thirdly, 231 men had the course of chloroquine together with primaquine, 15 mgm. in single daily dose for 14 days, and none relapsed. With these doses there were no significant toxic effects.

In assessing possible toxic effects with heavier doses and for long periods, 2 groups of volunteer prisoners were given drugs in varying dosage. In all 699 white adult males, some of whom were suffering from *P. vivax* malarial attacks, were treated in groups with recognized schizonticidal drugs, mainly, quinine, chloroquine, daraprim, together with primaquine. Mepacrine was not given since association with pamaquin enhances the latter's toxicity.

Tests were made to detect evidence of haemolysis, depression of marrow function, and effects on liver function.

Primaquine in doses between 15 mgm. and 30 mgm. produced no other toxic changes than mild to moderate abdominal cramps, very slight anaemia, and evidences of some stimulation of leucocyte formation.

Tests were made with doses ranging from 60 mgm. daily to 240 mgm. daily. Evidence was found of gastro-intestinal irritation, with some cyanosis due to methaemoglobinaemia, and with the heavier dosage some depression of marrow function as shown by leucopenia.

Comparison with pamaquin in these tests showed that primaquine is about 4 times as effective, and weight for weight, much less toxic.

Since the incidence of haemolytic complications of other 8-aminoquinoline anti-malarial drugs is known to be greater in dark-skinned races, tests of the effectiveness and toxicity of primaquine were tried with 110 volunteer adult male Negro prisoners. Four schemes of drug administration were tried : all the men received 30 mgm. primaquine daily for 14 days ; 25 men had in addition 2 gm. quinine sulphate daily for 14 days ; 25 had in addition to primaquine 0·6 gm. chloroquine base on the first day, and 0·45 gm. on the second day ; and 10 others had the same initial doses of chloroquine but continued for 12 days on 0·3 gm. per day.

Of the 110 men, 105 were able to complete the 14-day course : 17 had mild anaemia, and 5 developed severe anaemia necessitating discontinuance of the drug after 4 to 9 days In these 5 the serum bilirubin was raised. The numbers were too few to discover whether coincidental administration of quinine or chloroquine increased the tendency to haemolysis. No evidence of marrow depression was obtained in these cases.

It may be concluded that primaquine in a dose of 15 mgm. daily for 14 days is as effective as pamaquin (given in about twice this amount) in eradicating the tendency to relapse of the Korean strain of *P. vivax* parasites ; and that the drug shows similar toxic properties to the other 8-aminoquinolines, but in less degree. Dosages above 30 mgm. daily are liable to produce haemolytic effects in dark-skinned races. Till further work has been done, it should not be given with mepacrine.

ii. These findings are summarized in an editorial in the *Journal*.

S. Bell

i. Wilson, T. & Edeson, J. F. B. **Treatment of Acute Malaria with Pyrimethamine.** *Brit. Med. J.* 1953, Jan. 31, 253–5.

ii. Boyd, J. S. K. **Treatment of Acute Malaria with Pyrimethamine.** [Correspondence.] *Brit. Med. J.* 1953, Feb. 7, 337–8.

i. Pyrimethamine [Daraprim] was used for the treatment of 126 patients admitted to hospital for acute malaria. The subjects treated were semi-immune Asians residing in the Kuala Lumpur and Tampin Districts of Malaya. Eighty of them had suffered from previously untreated attacks of acute *P. falciparum* malaria.

A single dose of 50 mgm. of pyrimethamine failed to cure 2 out of 15 patients ; a dose of 100 mgm. (in 2 doses of 50 mgm. each) failed to cure 4 out of 39 ; and a total dose of 300 mgm. (100 mgm. on the first day and 50 mgm. daily for the next 4 days) failed to cure 7 out of 26 patients. The criterion of failure was the continued presence of asexual parasites on the 7th day or the necessity for therapeutic interference with another drug before the 7th day. Apart from the failures, the action on fever and symptoms was usually slow.

Twenty-four patients whose *P. falciparum* infections had proved refractory to treatment with proguanil were given 100 mgm. of pyrimethamine. The results were similar to those obtained with the other subjects treated, and the authors consider that cross-resistance with proguanil is unlikely to have been responsible for failures in the other groups. They regard pyrimethamine as unsuitable for the treatment of acute malaria due to Malayan strains of *P. falciparum*.

ii. Brigadier Boyd draws attention to the findings of Robertson *et al.* [this *Bulletin*, 1953, v. 50, 186] that a proguanil-resistant strain of *P. falciparum* from Malaya was resistant to pyrimethamine also, and suggests that the clinical cure of the 24 proguanil-resistant cases reported by Wilson and Edeson may have been due to the combined or cumulative action of both drugs or these two factors simultaneously.

G. Covell

Ruiz-Sánchez, F., Quezada, M., Paredes, M., Casillas, Josefina & Riebeling, Rebeca. **Chloramphenicol in Malaria.** *Amer. J. Trop. Med. & Hyg.* 1952, Nov., v. 1, No. 6, 936–40, 4 figs.

The authors, in Mexico, studied 9 male and 6 female patients of ages ranging from 13 to 60 years ; 12 were suffering from *P. vivax* malaria, one from *P. falciparum* malaria and two from double infections. They were treated with chloramphenicol in dosages between 50 mgm. and 75 mgm./kgm./day for 6 days (one case), 8 days (13 cases) and 10 days (one case). The patients had been ill for periods of 6 to 32 days ; 10 had daily febrile attacks and 5 had attacks on alternate days. Fever gradually resolved under treatment, with an average of 3·5 febrile episodes after administration of the first dose. Parasites persisted in the blood films for 8 to 10 days, and *P. falciparum* gametocytes seemed

unaltered by the treatment. The cases have been followed for periods from 6 weeks to 3 months, during which no relapse has been reported.

The conclusion reached is that though chloramphenicol has some effect as a schizonticidal drug in malaria, it is slow in action and inferior to other anti-malarials.

[Besides having little anti-malarial activity, it may be added that its cost and the possible complication of aplastic anaemia make it expensive and potentially dangerous.] *S. Bell*

DE SMET, R. Essai de prophylaxie antipaludique à l'amodiaquine. Note préliminaire. [**Trials of Malaria Prophylaxis with Camoquin**] *Ann. Soc. Belge de Méd. Trop.* 1952, Oct. 31, v. 32, No. 5, 421–8.

The investigations here described were undertaken in the Belgian Congo with the object of determining the optimum dose of amodiaquine [camoquin] for the prophylaxis of malaria and to compare its action in this respect with that of other anti-malarial drugs. The subjects of the experiment were African children aged from 0 to 12 years. Examination of blood smears from 2,358 of these yielded a parasite rate of 11·28 per cent. Of the 266 positive smears 92·48 per cent. showed *P. falciparum* only, 6·76 per cent. mixed infections with *P. falciparum* and *P. vivax*, 0·36 per cent. *P. vivax* only and 0·36 per cent. mixed *P. falciparum* and *P. malariae*.

To determine the optimum prophylactic dose, 23 groups with 5 children in each group were treated with amodiaquine in amounts varying from a single dose of 5 mgm./kgm. to a dosage of 30 mgm./kgm. for 3 consecutive days. The blood of each subject was examined daily for 15 days, then every 5 days up to the 30th day. Each subject was examined for enlargement of spleen, signs of toxicity and rise of temperature during this period.

It was concluded from these observations that the optimum amount of amodiaquine for prophylaxis was 25 mgm./kgm. body weight given in a single dose. Amounts less than this were ineffective, while greater amounts gave rise to toxic side-effects.

To compare the action of amodiaquine with that of other drugs, 5 groups of 25 in each group were used. The first received no drug and acted as a control. The second received 3 mgm./kgm. mepacrine in a single dose twice weekly ; the third 3 mgm./kgm. proguanil twice weekly ; the fourth 5 mgm./kgm. nivaquine [chloroquine] twice weekly ; the fifth 20 mgm./kgm. amodiaquine twice weekly. Subsequently, as the result of observations made in the first series of tests, a supplementary group of 20 individuals was given a single dose of 25 mgm./kgm. amodiaquine once a month. Spleen and blood examinations were carried out once weekly, over a period of 12 weeks.

From the results obtained the author concludes that amodiaquine is superior to both mepacrine and proguanil as a prophylactic agent in the dosage given and is approximately equal to nivaquine. The results obtained with the last group, however, suggest that amodiaquine is effective in a single monthly dose of 25 mgm./kgm. body weight. If this is confirmed it would be of great economic advantage when treating large communities.

[The effect of giving a single monthly dose of each of the other anti-malarial drugs, however, was not tested.] *G. Covell*

RAFI, S. M. **Malaria Problems of the Punjab and Malaria Control.** *Pakistan J. of Health.* 1952, Oct., v. 2, No. 3, 183–9, 1 chart.

The author presents a general account of malaria in the Punjab which aims at providing a reasonable summary of the position rather than adding to

existing knowledge. The importance of control is stressed ; the method of choice is by residual insecticides, but there is a place for drug treatment, public education and legislation. *G. Macdonald*

Soeparmo H. T. & Stoker, W. J. **Malaria Control in Indonesia.** Reprinted from *Madjalah Kedokteran Indonesia* (*J. Indonesian Med. Ass.*) 1952, July, v. 2, No. 7, 8 pp., 1 map.

The paper consists of a statement of the extent to which residual insecticides have been used either experimentally or as a routine in Indonesia, and the projects for expansion. Experimental schemes were carried out in places where *Anopheles sundaicus*, *A. aconitus* and *A. maculatus* were the vectors, and their efficacy was measured by malariometric and entomological assessment. On the basis of the knowledge thus gained a standard process has been developed. DDT wettable powder is used in a 5 per cent. suspension to give 2 gm. per square metre ; walls are sprayed up to a height of 2·5 metres (8 ft.). Spraying is carried out once annually. Dosage was originally checked by the Alessandrini test, but biological tests will be substituted. There were 4 experimental schemes and one WHO demonstration scheme, which protected 57,000 people ; there are now 10 routine schemes and a total of 999,000 people are protected. The routine schemes are in areas where *A. sundaicus*, *A. aconitus*, *A. minimus* and *A. subpictus* are the vectors.

Expansion is proposed as soon as difficulties in supply, accommodation and training of staff can be overcome. The proposal is to protect 5 million people in 1953 and 30 million people 5 years later. *G. Macdonald*

Chow, C. Y. **Mosquito and Malaria Control in Taiwan (Formosa).** *Mosquito News.* 1952, Dec., v. 12, No. 4, 243–6. [17 refs.]

Malaria affects most of the population of 7,500,000 persons in the island of Taiwan, China. The hills are hyperendemic areas (spleen rate 40–85 per cent., parasite rate 15–40 per cent.) ; the plains have a lower endemicity (spleen rate 10–40 per cent., parasite rate 2–15 per cent.) ; and the coast with a spleen rate of less than 5 per cent. and a parasite rate of 2 per cent. is comparatively healthy. Malaria control and research have been in operation since about 1909. *Anopheles minimus* is now considered the important vector, although 7 species, including *A. hyrcanus sinensis*, were reported as positive for sporozoites naturally about 20 years ago.

Until 1944 malaria control depended on quinine treatment of cases determined by some 200 anti-malarial stations distributed over the island, together with sporadic efforts at mosquito-control by the various methods then generally recommended. During the war various factors, including shortage of drugs, led to an increase in malarial incidence. The immediate post-war period has witnessed a revival in malaria research on the island. Anti-malarial stations have been re-established and a Malaria Research Institute set up. Work has been directed towards studies on mosquito biology, drug efficiency and the use of DDT against mosquitoes. A plant has been built which produces quantities of DDT in different formulations. Work since 1946 indicates that the vectors are domestic and likely to be susceptible to control—perhaps eradication—by DDT treatment alone of dwellings, possibly only selected rooms such as bedrooms and living rooms. An attempt may be made to achieve a satisfactory result by this method. Trained personnel, good communications and a co-operative public are favourable factors.

D. S. Bertram

KRUSE', C. W., HAWKINS, W. B. & LUDVIK, G. F. **Resistance of *Anopheles quadrimaculatus* to DDT in the Tennessee Valley.** *J. Econom. Entom.* 1952, Oct., v. 45, No. 5, 810–14, 2 figs.

Certain Culicine mosquitoes have previously been reported to be resistant to DDT, but this is the first instance of resistance in an Anopheline mosquito.

The evidence for resistance of *Anopheles quadrimaculatus* to DDT in Tennessee is based on both laboratory and field tests. Plates containing 4th instar insectary-reared *A. quadrimaculatus* larvae were distributed in the field and exposed to insecticide sprayed from aircraft. The plates were covered immediately after spraying and the dead larvae counted after 24 hours. At the same time the amount of DDT recovered was noted. In 1950 and 1951 it was necessary to use 10 to 25 times the amount of DDT required to give a 50 per cent. kill of larvae in 1949 and previous years. Observations made at various sampling points in the field showed that whereas 0·0005 lb. DDT per acre was required in 1944 to give a 90 per cent. kill of larvae, in 1951 0·13 lb. per acre was required to give the same kill.

The insectary stocks were reinforced from time to time with "wild" mosquitoes, sometimes collected from areas which had been treated with hydrocarbon insecticides, and it is suggested that this may have been the source of resistance. There was no evidence of resistance in *A. quadrimaculatus* collected from treated areas of the Kentucky Reservoir, however, and therefore it seemed likely that the intensive spraying of adjacent cotton growing areas with hydrocarbon insecticides may be responsible for the development of resistance in mosquitoes.

Laboratory tests with larvae of the insectary-reared strain show that in 1945 the 48-hour median lethal dose was 0·1 p.p.m. of DDT for both emulsions and acetone suspensions of the insecticide in distilled water. In 1951 the medial lethal dose for larvae was 0·5 p.p.m. of DDT as an alcohol-distilled-water suspension. Owing to the variability of results with these methods further tests were devised in which DDT was applied as a surface film in kerosene. The data from the various tests were correlated and there appeared to be a 17-fold increase in the LD50 from 1945 to 1951. [It should be noted, however, that since the test methods used in 1945 and 1951 were different the data cannot strictly be compared.]

In field tests at Hurstburg, Tennessee, a pond which contained large numbers of *A. quadrimaculatus* larvae was sprayed with DDT larvicide from an aircraft. The effectiveness of the treatment was estimated by larval dipping tests. To give an efficient control it was found necessary to use double the amount of DDT which had proved effective in previous years.

C. Mary Harrison

See also p. 462, HERMS, **Recent Developments in the Control of Rice Field Mosquitoes in California.**

MERCADO, Teresa I. **Blood Sugar Studies on the White Rat infected with *Plasmodium berghei*.** *Amer. J. Trop. Med. & Hyg.* 1952, Nov., v. 1, No. 6, 932–5.

This investigation deals with the blood sugar level of female white rats infected with *P. berghei*. The samples of blood obtained from the heart under anaesthesia were heparinized, and the glucose content was estimated by the method of HAGEDORN and JENSEN, at short intervals during the period of patent infection, and the percentage of parasitized cells was counted. Determinations of sugar were also made in some cases on blood serum and packed

red cells. Control experiments were carried out on uninfected animals. It was found that there was a marked drop in the sugar level of whole blood and serum when the parasitaemia was 50 per cent. or over. The value for sugar in the packed cells remained relatively constant during the infection but was higher than that found in the normal animal. *J. D. Fulton*

i. Maegraith, B. G., Deegan, T. & Jones, E. S. **Suppression of Malaria (*P. berghei*) by Milk.** *Brit. Med. J.* 1952, Dec. 27, 1382–4.

ii. British Med. J. 1952, Dec. 27, 1405. [11 refs.] **Milk and Malaria.**

i. During earlier investigations on haemoglobin metabolism in rats infected with *P. berghei* by blood inoculation, the authors experienced difficulty in infecting animals receiving a milk diet containing small amounts of certain B vitamins and calcium pantothenate. Further experiment has now shown that in rats and mice on milk diets of different types (cow's milk, reconstituted cow's milk, and human milk) suppression of blood-induced infection of *P. berghei* can be brought about.

The strain of parasite used was one which generally killed laboratory rats fed on a normal diet and was inoculated intraperitoneally to animals of the same age and weight (about 200 gm.) so that each received a standard dose of 1 million parasites in 0·2 ml. citrated saline. The control animals received a standard laboratory diet whose composition is given. Cow's milk was fortified by addition of 5 mgm. vitamins B_1 and B_6 and 50 mgm. calcium pantothenate per kgm. Each animal was allowed 150 to 160 ml. per day containing 4 to 5 gm. protein. Reconstituted cow's milk received the same quantity of vitamins and was given in the same amounts as cow's milk and human milk. No vitamins were added to the human milk and its protein content in the daily dose was approximately 3 gm. Each animal was fed separately on the diet being investigated for a few days before infection. Animals fed on the different milk diets lost weight, whereas a normal diet caused an increase in weight.

The course of infection was followed in stained films from tail blood by making rough counts of the number of parasites per field of the oil-immersion lens. The results of 5 experiments are indicated in tables and show that a diet of milk with added vitamins had a suppressive effect on blood-induced infections of *P. berghei*, sometimes complete in that no parasites were detectable in the peripheral blood, but in other cases a few parasites were visible, depending on the nature of the original inoculum. The authors concluded that the milk exerted a suppressive rather than a curative effect (though the latter probably occurred in some animals) since subinoculations of blood from animals on the milk diet without visible infection for a considerable number of days usually gave rise to infection within the normal period in fresh animals. In other cases when the normal laboratory diet replaced a milk diet, latent infection became apparent but was seldom severe. Attention is drawn to the fact that severe malarial infection is rarely seen in infants up to 3 months of age and it is possible that some factor in milk may be implicated.

ii. In an annotation in the same journal the implications of this interesting and possibly significant discovery of the authors are discussed. The suggestion is made that some factor may be absent from milk which is necessary for development of the malaria parasite, since experiment showed that *P. berghei* infections were not suppressed when a normal diet was given to rats along with milk *ad lib.* It is apparently known from recent work that milk, as well as other substances, exercises a marked influence on the growth of bacteria

and viruses under certain conditions. The value of milk diet on human malaria infections will have to be considered and a new field of investigation may be opened. *J. D. Fulton*

Darrow, Edith M., Gingrich, W. D. & Prine, Joanna H. **The Effect of Antibiotics on Experimental Malaria** (*Plasmodium cathemerium* **and** *Plasmodium berghei*). *Amer. J. Trop. Med. & Hyg.* 1952, Nov., v. 1, No. 6, 927–31. [11 refs.]

Up to the present no marked success has been obtained with antibiotics in the treatment of malaria. The present authors have screened a number of substances, especially those from certain species of *Streptomyces*, against *P. cathemerium* infections in canaries and *P. berghei* in mice. The drugs were administered twice a day orally to birds, except dihydrostreptomycin and neomycin which were injected subcutaneously. Treatment of blood infections was begun soon after inoculation and the antibiotics were given prior to inoculation in prophylactic experiments, being generally continued for 4½ days. In the case of mice the drug was administered in a drug-diet mixture. Blood inoculations were used in both hosts in suppressant experiments, but sporozoites from one infected mosquito were inoculated into each canary in the prophylactic experiments. Quinine served as a standard for comparing the activities of the various substances. When parasites failed to appear as the result of treatment fresh hosts were subinoculated or the original host was challenged by a large inoculum.

In the canary it was found that aureomycin and terramycin exerted a marked prophylactic effect, and in some cases complete protection was afforded. Aureomycin is also a good suppressant, whereas chloramphenicol possessed limited activity. Cures were not obtained with any drug either alone or in combination with quinine. The remainder of the antibiotics tested against canary infections were inactive. In suppressant experiments with *P. berghei* the results were similar to those obtained in the canary. *J. D. Fulton*

Clark, E. W. & Ball, G. H. **The Free Amino Acids in the Whole Bodies of Culicid Mosquitoes.** *Exper. Parasit.* New York. 1952, Nov., v. 1, No. 4, 339–46. [27 refs.]

A medium suitable for maintaining the stomach of *Culex tarsalis* in a healthy state during the attempted cultivation of oöcysts of *P. relictum in vitro* proved difficult to find. In trying to obtain information on the requisite composition of such a medium analysis of the free amino acids in the body of the above mosquito and others as well as that of the haemolymph of 5 non-culicide insects has been carried out. When body amino acids were being determined 6 to 40 starved mosquitoes were homogenized and deproteinized with cold 85 per cent. alcohol. The filtrate and washings were then concentrated in a stream of air to a volume of 100 microlitres. Haemolymph was similarly treated or deproteinized with 10 per cent. trichloracetic acid as alternative. Qualitative analysis of the amino acids was made with the use of a two-dimensional ascending paper chromatographic technique with 3 different solvents for comparison on Whatman No. 1 filter paper, followed by development with ninhydrin. The results of the analyses are presented in tabular form. Some of these acids were found to be consistently present in the 4 species of mosquito analysed. Similar regularities were noted in the haemolymph analyses. Differences in composition were noted in certain genera and species, and could provide help in identification as well as indicating why a plasmodium can parasitize some of these species and not others. *J. D. Fulton*

RIGDON, R. H., MICKS, D. W. & BRESLIN, Dorothy. **Effect of Phenylhydrazine Hydrochloride on *Plasmodium lophurae* Infection in the Duck.** *Trans. Roy. Soc. Trop. Med. & Hyg.* 1953, Jan., v. 47, No. 1, 70–76, 5 graphs. & 1 fig. on pl.

A number of observations on the effect of phenylhydrazine on malarial infections have been recorded by WISELOGLE [this *Bulletin*, 1947, v. 44, 1106]. The present authors [*ibid.*, 1951, v. 48, 714] found that the substance was able to prevent a fatal issue in *P. knowlesi* infections of monkeys. It was suggested in explanation that the chemical in some way affected the haemoglobin of the host red cell. A more detailed study has now been made on the effect of the compound in *P. lophurae* infections of the duck. Young hosts were inoculated intravenously with infected blood, and the drug, dissolved in ethyl alcohol to give a 2 per cent. solution, was administered by catheter. Doses of 5 to 40 mgm. were given at intervals to ducks which weighed from 300 to 1,300 gm. There was only a small margin between the effective and lethal dose. In normal ducks phenylhydrazine caused a fall in the red cell count with appearance of erythroblasts, but a return to normal soon followed. Marked changes occurred in the red cell nuclei followed by altered staining reactions and disintegration. During infections with *P. lophurae* in the absence of drug the authors have noted changes in parasitized and non-parasitized cells comparable to those produced by phenylhydrazine. In general the degree of parasitaemia was less in the drug-treated birds than in the control groups. In contrast to the authors' experience with monkeys, no degeneration of parasites occurred in treated ducks and the haemoglobin in the duck cells, unlike the nucleus, appeared to be unaffected.

J. D. Fulton

JASWANT SINGH, BASU, P. C. & RAY, A. P. **Prophylactic Trials against *P. gallinaceum* in Fowls.** *Indian J. Malariology.* 1952, Mar., v. 6, No. 1, 123–32. [27 refs.]

Prophylactic trials with anti-malarial drugs of widely different character have been carried out with sporozoite-induced infections of *P. gallinaceum* in fowls, a total of 124 aged from 6 to 12 months being used. Dissected glands from *Aëdes aegypti* mosquitoes with heavy infections were suspended in 2 to 3 ml. serum-saline and injected in a wing vein of the fowl to produce infection. The drug, in dosage based on mgm. of base per kgm. weight of the host, was administered by the oral route through a rubber catheter soon after inoculation, 2 daily doses being given for 4 days. Stained blood and tissue smears were used to follow the course of infection. When animals inoculated with sporozoites which had received the drug failed to show parasitaemia after a period of 1 month they were challenged with an inoculum of 30 million erythrocytic parasites per kgm. From the results obtained the nature of the original infection was deduced. It was found that quinine, mepacrine, and amodiaquin, like chloroquine, exerted no causal prophylactic effect, but chloroquine in dosage of 5 mgm./kgm. suppressed parasitaemia over the 4 weeks' observation period. Pamaquin [plasmoquine] and primaquine both possessed marked prophylactic action. In 100 mgm./kgm. dosage sulphadiazine exerted full protection and likewise proguanil [paludrine] and bromguanide in dosage of 7·5 and 15 mgm./kgm. respectively, and partial protection on a dosage of 5 mgm./kgm. Proguanil with pamaquin appeared to exercise a synergistic effect. Daraprim was as effective as any of the substances tested.

J. D. Fulton

McConnachie, Elspeth W. **The Action of 2 : 4-Diamino-6 : 7-Di*iso*propylpteridine on Normal, Proguanil- and Sulphadiazine-Resistant Strains of *Plasmodium gallinaceum*.** *Parasitology*. 1953, Jan., v. 42, Nos. 3/4, 272–6. [20 refs.]

Certain pteridines have been shown to be active against *P. gallinaceum* infections in chicks [this *Bulletin*, 1950, v. 47, 443 ; 1951, v. 48, 872] and since the substance 2 : 4-diamino-6 : 7-di*iso*propylpteridine (reference Number 0/129) has been shown to possess vibriostatic activity [*ibid.*, 1950, v. 47, 980, 1196] it appeared of interest to test it against malaria. Chickens were infected intravenously with 50 million parasites from strains maintained as patent infections in chicks by blood inoculations at short intervals. The drugs were given orally or intraperitoneally in 10 per cent. gum acacia when not soluble in water. The development of resistant strains and method of test have been described in a number of earlier publications. It was found that the therapeutic index for 0/129 was 1 : 40, being about three times that of quinine. Proguanil-resistant and sulphadiazine-proguanil-resistant strains of *P. gallinaceum* were cross-resistant to 2 : 4-diamino-6 : 7-diphenylpteridine, but not to the substance mentioned in the title (0/129), being in fact somewhat more sensitive to this compound. *J. D. Fulton*

Bishop, Ann & McConnachie, Elspeth W. **The Development of Resistance to Metachloridine in *Plasmodium gallinaceum* in Chicks.** *Parasitology*. 1953, Jan., v. 42, Nos. 3/4, 277–86. [45 refs.]

Strains of various malaria parasites including the human forms have been made resistant to certain drugs which include pamaquin [plasmoquine], quinine, sulphonamides, and proguanil [paludrine]. Because of the fact that high resistance of *P. gallinaceum* has been shown only to proguanil and sulphadiazine, which appear to resemble one another in their modes of action, it was decided to attempt to prepare a strain of the same parasite resistant to a substance of different constitution, namely metachloridine (3-metanilamido-5-chloropyrimidine). This substance has a high chemotherapeutic index and a high degree of resistance can therefore be developed. Its action against *P. gallinaceum* is not antagonized by PABA or by pteroylglutamic acid. The strain of *P. gallinaceum* used had been maintained in chicks in a patent state by frequent intravenous injections over a period of some years.

To produce resistance the drugs were given orally once or twice daily ; metachloridine was rendered soluble by alkali and sulphadiazine was given in 10 per cent. gum acacia. During production of the resistant strain care was taken not to administer too much metachloridine and thus convert a patent to a latent parasitaemia. The original single daily dose was therefore 0·025 mgm. per 20 gm. bird and was gradually increased. After 9 weeks doses of 3·2 mgm. were tolerated twice daily without affecting the parasites. An increase in resistance also developed in strains receiving only 0·025 gm. over a long period, so that resistance to the drug exceeded the doses to which the parasites were exposed. The former strain, whose resistance to metachloridine had increased some 100-fold, was used in studying the relationship of metachloridine activity to that of other anti-malarials. Selection of resistant individuals in the normal parasite population did not appear to contribute to the production of resistance. From cross-resistance tests it was concluded that metachloridine has a different mode of action from pamaquin, mepacrine, quinine, or chloroquine. The metachloridine-resistant strain showed slight resistance only to sulphadiazine, sulphapyridine, and sulphathiazole, but not to sulphanilamide or proguanil.

J. D. Fulton

TRYPANOSOMIASIS

COLONIAL OFFICE. **Colonial Research 1951–1952. Tsetse Fly and Trypanosomiasis Committee. Report for 1951–1952** [BARNES, W. L. Gorell, Chairman] (pp. 221–33). Cmd. 8665. 253 pp. 1952, Sept. London: H.M. Stationery Office. [6*s.* 6*d.*]

The Committee is concerned with the co-ordination of research and reclamation in human and animal trypanosomiasis in British territories in Africa.

In East Africa, its function is effected largely through the work of the East African Tsetse and Trypanosomiasis Research and Reclamation Organization. About a third of the present report covers in a brief way the subject matter contained in this Organization's own annual report for 1951 [see below, 1953, p. 389].

The Committee's responsibilities for research, personnel training and advisory services on problems of tsetse and trypanosomiasis in West Africa are centred in the West African Institute for Trypanosomiasis Research in Nigeria. It is clear that in the few years in which this has been in existence, substantial contributions to numerous aspects of tsetse and trypanosomiasis have been made and are due for publication shortly. The type of work done and the results obtained are only referred to in general terms in the present report but the scope of research is clearly wide and expanding. Some of the principal subjects are indicated below. Entomological work includes successful rearing of tsetse [species?] in the laboratory to the extent of producing 1,000 pupae per month for experimental use. Earlier field work on *G. palpalis* is now being analysed and *G. morsitans* in Nigeria is to be studied, the programme of work representing the first attempt to investigate this species comprehensively in West Africa. Recent advances and invasions by *G. morsitans* give this work particular purpose. More attention to less well-known species in high forest areas is proposed and, already, preliminary observations show them to be probably of more than academic interest.

Field survey has continued on the epidemiology of human sleeping sickness in West Africa with a view to publication of a comprehensive work on the subject in due course.

Strains of *T. gambiense* are being isolated in the laboratory and their maintenance by tsetse transmission, with the use of laboratory-bred flies, is the aim of the Institute, as a preliminary to drug assays. Material to elucidate the pathology of human and animal trypanosomiasis is being collected and methods for improved diagnosis, especially of cryptic infections, are being sought.

The testing of the curative and prophylactic value of drugs is an important part of the work of the Institute and, although it does not prepare or synthesize drugs, it has obtained by agreement with suppliers a high standard of purity and stability in preparations submitted by them for field trials. Melarsen, Msb, pentamidine, antrycide methyl sulphate, and an antrycide prophylactic mixture are at different stages of observation in large field trials against human or animal trypanosomiasis, either as curative or as prophylactic agents. Prophylactic use of antrycide at 10-week intervals gives good protection to cattle against infection from *G. palpalis*, but not so against the heavier risks associated with *G. morsitans*. It is also effective in protecting cattle trekking through tsetse country to market. All treated cattle remained healthy and gained 13 kgm. per head on the average; untreated cattle were all infected, some died, and the average loss per head was 11 kgm. Of 4 new phenanthridinium drugs recently put on trial, 2 were successful curatively (against *T. vivax* in Zebu cattle) with no dermatitis or photosensitization effects.

Some work has been in progress on the natural tolerance of native cattle to trypanosomes. A herd of 12 Zebu, 8 N'dama and 12 N'dama/Zebu crosses were

kept for over 2 years in natural conditions of exposure to infection in a *G. morsitans* area. The N'dama cattle remained in good condition but all the others contracted heavy and finally fatal infections. The nature of this resistance, or tolerance, is being explored.

Various protozoological studies on *T. vivax* have been made possible as a result of successful passage by syringe of this parasite through rabbits (36th passage) and white rats (35th passage). This notable success in technique depended on the inoculation into each recipient host of clean sheep or ox blood within 24 hours of the passage-injection. The serum, probably its protein fraction, seems to be the vital element in the added blood. High infection rates of *T. vivax* in tsetse fly can now be induced in the laboratory.

The Committee reports a new promising anti-trypanosome drug, "528", with chemical characteristics novel in the field of trypanosomiasis. It is being produced in quantities adequate for field trials. The Committee note that the papers and conclusions of the third meeting of the International Scientific Committee for Trypanosomiasis Research held in 1951 are to be published by the Permanent Inter-Africa Bureau for Tsetse and Trypanosomiasis, Leopoldville, Belgian Congo.

Progress has been made in getting on with the task of bringing together the recorded information available in Britain, on the Continent, and in Africa about African mammals. Office facilities have been provided by the Zoological Society of London. *D. S. Bertram*

East Africa High Commission. **East African Tsetse and Trypanosomiasis Research and Reclamation Organization. Annual Report 1951** [Lester, H. M. O.]. **Tsetse Research** [Jackson, C. H. N., 9–23]. **Trypanosomiasis Research** [Willett, K. S., 24–5]. **Tsetse Reclamation** [Lewis, E. A., 26–56]. 56 pp., 3 figs. 1952. Nairobi.

[A serious drawback to this report is that there is neither a table of contents nor an index.]

The *introduction* by Dr. Lester discusses the realities to be taken into account in developing a practical policy in tsetse and trypanosomiasis research and reclamation. Tsetse-infested country may not be uninhabited merely because of the fly and the disease. It may have been abandoned to the fly because of soil exhaustion in earlier years or be otherwise unsuited to supporting a substantial, permanent, human community ; deficient surface water is an important factor. It may require much more than tsetse eradication to make land suitable for re-settling the communities at present existing in over-grazed, over-populated land. Wide considerations of this sort are fundamental and the basis on which the advisability of tsetse control in any area must be assessed.

The *composition of the Organization* enables it to develop pure research on tsetse and on trypanosomiasis, undertake field trials (particularly in experimental reclamation), and advise and assist in the conduct of pilot schemes in collaboration with the territorial departments of the East African colonies and protectorates. It is clear from the various parts of the report that a state has been reached in which to a very considerable degree research and practical problems are closely integrated to their mutual advantage in numerous ways.

As regards *drug therapy and prophylaxis* of trypanosomiasis the amount of work attempted has been restricted until the Central Trypanosomiasis Research Institute at Sukulu, Uganda, is opened. But with the collaboration of the East African Veterinary Research Organization, field experiments on antrycide continue. It is well established that in cattle strains of trypanosomes resistant to this drug develop rapidly although it is not yet clear how this comes about. Resistant strains are now known to persist in a district for 5 months (*T. vivax*)

and 7 months (*T. congolense*) after the removal of drug-treated cattle. It is also clear that the drug is suppressive and not protective prophylactically. Antrycide methyl sulphide is curatively very effective but not infallible.

The section on *tsetse research* is by Dr. Jackson. It is interesting to observe—and this is apparent throughout the report—that considerable progress has been made in bringing our knowledge and understanding of *Glossina pallidipes* up to the standard which has been achieved in the past for *morsitans*, *swynnertoni* and *palpalis*. This is important since *pallidipes* is easily overlooked by ordinary sampling methods, it is versatile in its choice of habitats, an important vector, and less readily, or less certainly, eliminated by game extermination, controlled bush fire, selective clearing or human settlement than other species. It causes some anxiety in certain areas now being resettled near Shinyanga research station, and is a threat to about 500 square miles of bush made apparently fly-free (*morsitans*, *swynnertoni* and *pallidipes*) by experimental game destruction completed in November 1950. In this area none of 11 cattle herded in the bush for most of the past year died or developed positive blood infections. This successful game experiment was completed at the reasonable cost of £50 per acre but it is noted that both re-invasion of fly and of game is difficult because of isolating barriers. It is concluded that discriminative clearing, particularly against *swynnertoni* and *morsitans*, is to be indicated as an additional, or preferred, measure where isolation is less complete. It is more lasting, particularly if it is accompanied by human settlement.

Both *swynnertoni* and *pallidipes* show evidence of a cycle of decline about every 10 years. Although the explanation is obscure, with some correlation with rainfall and sunspot frequency, the fact is important in interpreting results of control measures. The greatest difference is of the order of 90 per cent. reduction in numbers in a cycle.

Population studies, with the use of a marking system which could cater for the recognition of about 25,000 individual flies, have now been developed for *pallidipes* as formerly for other species. The proportion of freshly emerged unfed flies (teneral flies) caught varies from time to time but is a measure of hunger due to desiccation in dry weather rather than of emergence rates. This applies to *morsitans*, *swynnertoni* and *pallidipes*.

It has been shown that estimates of fly populations by marking and recapture (of *G. palpalis*) are close to reality. This was demonstrated in a field trial in which *palpalis* were hand-caught to elimination in an almost isolated riverine forest block, after the estimates had been made.

Other results include proof that marking with oil-paint is innocuous over 6 weeks ; fly-round catches are more informative if collecting halts are made at 50- and not at 100-yard intervals ; a bait-cow increases *pallidipes* catches by 3½ times catches on a screen. The characteristics of pupal sites have been more fully determined for several species than hitherto, and point to important shifts in breeding-places in relation to season, environmental features, and altitude.

Breeding of laboratory strains of *morsitans*, *swynnertoni* and *pallidipes* has been investigated with "Geigy cages" and other methods. Cyclical development was obtained except in *pallidipes* in which the laboratory-bred adults refused to mate. But a high proportion of flies in all strains were undersized. They, like wild flies soon after capture, were low in fat content. The problem is unresolved ; glycogen content is now being investigated.

The collection of sera of wild animals of Africa and preparation of antisera (mainly at the Lister Institute near London) has progressed well and large collections of tsetse blood-meals are in store for test in due course. Most of the probable hosts, except some closely related antelope, can now be tested for ; further separation of this difficult group is not improbable.

Dr. Willett, on *trypanosomiasis research*, notes that the *T. rhodesiense* strain transmitted by *morsitans* through sheep for 17 years is, as expected, passing through a phase of diminished infectivity to human volunteers but, against expectation, in a *small* number of sheep there was no evidence of increased virulence in animals. Further work continues in maintaining the Shinyanga I strain of *T. brucei* in animals with a view to comparing in due course its capacity to suppress *T. rhodesiense* infections with that in other *T. brucei* strains in nature.

Tsetse reclamation is reported by Dr. Lewis. It is notable that there is increasing integration of research findings into reclamation work, and elucidation of research problems as coincident features of reclamation. For example, important progress has been made both by detailed studies in small, strictly experimental areas and over more extensive regions scheduled for reclamation on the determination of fly concentrations and the location of pupal sites ; how these are related to topographical and botanical characteristics and how they vary in distribution and density with seasons. This type of work has been well developed for *palpalis* and *pallidipes* on the shores of Lake Victoria and in the Lambwe Valley, Kenya ; and for *morsitans* in the miombo-covered hills near Tabora, Tanganyika, and in the hitherto persistent salient of the Tanganyika *morsitans* fly-belt which penetrates into Ankole in Uganda. The report includes a helpful outline of the numerous efforts since before 1930 to prevent this salient from extending over the Ankole pastures ; it records how this has failed so that, since 1947, there is virtually no fly-free territory between *morsitans* in the south and *pallidipes* in the north of Ankole. With the co-operation of the Uganda Tsetse Control Department this difficult situation, which seriously affects the use of nearly 2,000 square miles of good grazing, is to be vigorously attacked by forcing *pallidipes* north and *morsitans* south. The project envisages resettlement and usage of the land with suitable supervision. In this area, and again for *pallidipes* in the Lambwe Valley, there is accumulating a substantial body of data illustrating that the hill-top parkland, and thickets in the valleys or along the footslopes of the hills, are important foci of fly and pupae. The Lambwe Valley is a fertile soil inaccessible for development on account of *pallidipes*. Initial efforts to control it by game destruction failed on account of various factors, but in one area enough reduction occurred to permit a policy of limited settlement without cattle. Discriminative clearing may be practicable. In Tanganyika, near Tabora, the reduction of *G. morsitans* by selective clearing of bush and tree along the junction of the low miombo-covered hills with the intervening low, shallow valleys (*mbuga*) continues to give extremely satisfactory results. Improved precision may yet reduce the proportion of cleared vegetation to lower than 10 per cent. of the total woodland in the area. In 1951, 34 flies were taken in fly rounds, mainly in the early months, as against 8,319 in 1949. Arrangements are agreed for encouraging settlement but, meanwhile, without cattle.

Experimental control of *G. palpalis* on the shores of Lake Victoria and inland rivers near Port Victoria, Kenya, has been concluded. Intensive hand-catching eliminated the fly from lightly bushed small rivers ; larger rivers required, first, the breaking up of the heavier riverine forest-fringe into blocks by sheer felling of long stretches of it and then partially clearing trees and removing under-growth in the blocks themselves. This fly can cross $3\frac{1}{2}$ miles of sheer-felled clearing. As regards lakeside clearings : only 50 per cent. reduction followed sheer clearing for 30–50 yards back from the shore, contrary to eradication attained on Lake Tanganyika. *G. palpalis*, at Lake Victoria, also inhabits evergreen thicket some little way back from the immediate lacustrine forest fringe and this must have contributed to the limited success of shore-line felling. This work also indicated some reluctance by the fly to come to fly-boys and also long-term fluctuations in numbers which remain of uncertain origin.

Work on the use of insecticides is limited to further attempts, by aerial spraying of " Gammexane ", to eliminate the residual population of *swynnertoni* remaining in a naturally isolated block of bush after earlier smokes from ground canisters. Also, very encouraging results are reported in further experiments on the reduction of fly (*morsitans* and *swynnertoni*) by herding DDT-sprayed cattle at a density of 80 per square mile in fly-infected bush. Cattle are sprayed twice weekly. In two months fly-catches dropped by 99 per cent. (*morsitans*) and 95 per cent. (*swynnertoni*) with theoretical prospects of eradication after 3½ and 5 months, respectively.

A final section reviews briefly the commitments and services of the Organization in an advisory capacity and in practical control and reclamation schemes in collaboration with the territorial departments of Kenya, Tanganyika, and Uganda, and in Zanzibar against *G. austeni*.

The report includes two diagrams and a number of extremely instructive tables. *D. S. Bertram*

Pinto, A. R. da C. Relatório sobre o funcionamento da Missão de estudo e combate da doença do sono na Guiné Portuguesa referente ao ano de 1951. [**Report of the Sleeping Sickness Commission in Portuguese Guinea for 1951**] *Anais Inst. Med. Trop.* Lisbon. 1952, Mar., v. 9, No. 1, 265–93, 3 maps (2 folding on 2 pls.).

The work of the 3 divisions of the Commission—(1) investigation ; (2) diagnosis and treatment ; (3) combating the tsetse flies, was continued and extended during 1951. Besides sleeping sickness, other diseases, *e.g.*, schistosomiasis, filariasis, infestation with *Balantidium coli*, and molluscum contagiosum, were dealt with. The work on sleeping sickness consisted mainly of discovering and treating cases of infection, but also included investigation of chemo-resistance of *Trypanosoma gambiense*, the culture of *T. gambiense*, the renal function in sleeping sickness, the sedimentation rate, trial of the drug Arsobal, and the prophylactic use of pentamidine. In an examination of 214,100 people 1,945 new cases of sleeping sickness (0·9 per cent.) were found, 45 per cent. being in the nervous stage of the disease. The tsetse flies caught numbered 7,673 comprising 4,130 *Glossina palpalis*, 3,538 *G. submorsitans* and 5 *G. longipalpis*. Among 3,602 *G. palpalis* dissected, 44 had trypanosomes but only one had infected salivary glands. The report concludes with mention of the treatment centres, transport facilities, funds available, and the numbers and names of the staff. One map shows the distribution and incidence of sleeping sickness, another shows the distribution of the 4 species of tsetse flies (including *G. fusca*), and the third shows the positions of the 14 treatment posts. [Previous reports are summarized in this *Bulletin*, 1952, v. 49, 935 ; 1951, v. 48, 340 ; 1950, v. 47, 966 ; 1949, v. 46, 1013 ; 1948, v. 45, 1069.] *J. F. Corson*

Moçambique. Missão de combate às tripanossomíases. Relatório anual de 1950 [de Andrade Silva, M.A.]. [**Annual Report for 1950 of the Trypanosomiasis Commission**] 77 pp., 5 folding maps (3 coloured). 1952. Lourenço Marques : Imprensa Nacional de Moçambique.

This Report, the 4th, is chiefly a record of the continuation in 1950 of the work described in the three previous annual reports [see this *Bulletin*, 1949, v. 46, 984 ; 1951, v. 48, 339, 791 ; see also *ibid.*, 1948, v. 45, 1068 ; 1949, v. 46, 53].

The distribution of sleeping sickness in 1950 was about the same as in previous years ; 188 new cases, including one European, were discovered, 141 in Niassa

province and 47 in the Tete district, the incidence being 0·54 per 1,000. The early cases (29) were treated with antrypol, the advanced cases (157) with antrypol and tryparsamide or with pentamidine isethionate and tryparsamide. There were 225 old cases.

Chemoprophylaxis.—The results of the trials of antrypol and pentamidine, mentioned in the annual report for 1949, are given : in April, 1949, antrypol was given to 269 people ; they were re-examined in March, 1950, together with controls, and no cases of sleeping sickness were found in either group. Two trials with pentamidine were made ; in one, 317 persons had injections and were re-examined, 2, 6 and 13 months later with 354 controls and no trypanosome infection was found in either group. The same negative result was obtained in the second trial in which 199 people were injected, with 32 controls, and were re-examined 4, 8, 14 and 18 months later. No estimate of the protective value of the drugs could be made, but the method is thought to be unsuitable for Rhodesian sleeping sickness in a widely dispersed population, unless an epidemic occurs.

Animal trypanosomiasis.—The blood of 14,029 domestic animals, mostly cattle, was examined and 929 were found infected ; the commonest trypanosomes were *T. vivax* and *T. congolense*, but *T. simiae* was present in 160 of 353 pigs and *T. brucei* was found in 4, and *T. congolense* in 3, of 78 dogs examined. The blood of 1,085 wild mammals showed infection (*T. vivax* and *T. congolense*) in 13 (8 antelopes, 4 warthogs and 1 Cercopithecus monkey) ; no polymorphic trypanosomes were seen.

Treatment with drugs.—Dimidium bromide was given to 39,692 cattle and 16 pigs ; the results in cattle were good and it was concluded that cattle can be kept in areas infested with tsetse flies (including *G. morsitans*) by periodic treatment, provided there is good grazing. They were treated, usually, every 6 or 8 months, but about every 4 months in a prolonged dry season. The bodily state of the animals affected the photosensitive action of the drug. Two of the pigs were benefited but the other 14 died with acute trypanosomiasis. No effect on *T. brucei* in dogs was observed.

Antrycide was tried in cattle infected with *T. vivax* or *T. congolense* or both ; subcutaneous injections of 5 mgm./kgm. of the methylsulphate in 10 per cent. solution were used. No trypanosomes were seen on the following day and they did not reappear for several months ; repeated injections with various doses had a similar result. No noteworthy toxic symptoms occurred even with doses of 10 mgm./kgm. Experiments on a larger scale are being made to determine the curative action of antrycide methylsulphate and the prophylactic effect of " pro-salt " (a mixture of methylsulphate and chloride of antrycide).

The experiment to control *G. brevipalpis* in the Salamanga (Maputo) region by driving away the hippopotamuses (the only source of the fly's food except cattle) and then treating the cattle weekly with Gammexane and DDT in dipping tanks, mentioned in the Report for 1948, was successful. The number of tsetse flies captured, already reduced in December 1949 by expulsion of the hippopotamuses, declined to zero in April, 1950 ; one fly was caught in June, but none was caught or seen in the last half of 1950. The experiment proved that this combined method will eradicate *G. brevipalpis* in such circumstances and it is both economical and rapid.

From examination of the external genitalia of tsetse flies, especially *G. pallidipes*, it is thought that crossing occurs between different races in nature ; VANDERPLANK's work is referred to [this *Bulletin*, 1948, v. 45, 51 ; 1949, v. 46, 18, 1013].

The entomological work of the year is described, special attention being given to *G. austeni* ; a list of ticks with their hosts and localities is given.

The report ends with references to various matters such as inspections, visits, conferences, correspondence, and scientific publications by the Staff.

J. F. Corson

INOKI, S., KITAURA, T., NAKABAYASI, T. & KUROGOCHI, H. **Studies on the Immunological Variations in *Trypanosoma gambiense*. 1. A New Variation System and a New Experimental Method.** *Med. J. Osaka Univ.* 1952, Aug., v. 3, Nos. 2/3, 357–71, 3 figs. [35 refs.]

These experiments were made at Osaka University with a strain of *Trypanosoma gambiense* obtained from Tokio University ; the strain in mice is stated to have been so sensitive to inactivated human blood-serum that an intraperitoneal injection of more than 0·4 ml. of the serum would cure an early infection at once but a subcutaneous injection of 0·1–0·2 ml. was followed by a relapse in 4–10 days. Small doses of inactivated human serum were therefore used to obtain relapse strains. The agglomeration test and cross-infection inoculations were used to test the immunological differences of the various relapse strains.

The first relapse strains were all different immunologically from the original strain, and some of them, in different mice, were identical with one another. The second relapse strain (following an injection to check the first relapse strain infection) differed from both the original strain and the first relapse strain in the same mouse, but it might be identical with the first relapse strain in a different mouse. When a healthy mouse was infected with a first relapse strain, then given serum, the relapse that followed was called the first relapse relapse strain, and it differed from the second relapse strain, but was identical with the original strain—a reversal phenomenon.

Other experiments included the preliminary injection of the serum followed by inoculation of the original strain 1 or 3 days later ; in the former case the incubation period was lengthened and the strain became altered, while in the latter case there was no change.

The authors discuss their results with reference to the work and views of many earlier workers [see also this *Bulletin*, 1937, v. 34, 123, 555, 922 ; 1947, v. 44, 403 ; and abstracts in this *Bulletin* of many earlier papers].

J. F. Corson

BURTT, E. **The Effect of *Trypanosoma rhodesiense* on Temperatures of Sheep.** Reprinted from *East African Agric. J.* 1952, July, v. 18, No. 1, 1–4, 1 fig. [12 refs.]

At Tinde in Tanganyika Territory, sheep and goats have been used for several years as experimental animals in research on Rhodesian sleeping sickness ; while engaged in this work from 1942 to 1944 the author recorded the early morning temperatures of 12 healthy sheep and 7 healthy goats. The temperature of 9 of the sheep was also recorded after they had been infected with *Trypanosoma rhodesiense*. In the case of the healthy sheep the temperature was always above 101°F. and sometimes reached 104°F., the mean being 102·08°F. Infection caused a rise of temperature and the mean was found to be 102·9°F. The mean temperature of the goats was 101·25°F. The author quotes the figures of other observers in different parts of the world.

J. F. Corson

JACKSON, C. H. N. **A New Specific Character for Tsetse-Flies (*Glossina*) of the *morsitans* Group.** *Ann. Trop. Med. & Parasit.* 1952, Nov., v. 46, No. 3, 218–19, 8 figs. on 2 pls.

This paper describes, and illustrates with 8 photographs, a difference to be observed in the shape of the basal plate (ninth tergo-sternum) which is exposed

to view when the hypopygium of the male genitalia of tsetse flies of the *morsitans* group is flexed open. The character is particularly of value in differentiating *G. pallidipes* and *G. longipalpis*, and valid for *G. morsitans*, probably *morsitans* var. *submorsitans*, and for *swynnertoni* and *austeni*. It is not established whether it will be helpful or not in differentiating races of *morsitans*.

D. S. Bertram

Serrano, A. de M. Um reconhecimento glossínico no distrito do Lago. [**A Tsetse Survey of the Lago District, Mozambique**] *Anais Inst. Med. Trop.* Lisbon. 1951, Dec., v. 8, No. 4, 645–87, 25 figs. & 3 folding maps.

This paper describes the environment and distribution of game and tsetse (*G. morsitans*) in the Lago district, which lies in the northern part of Mozambique, and includes part of the east shore of Lake Nyasa. *P. A. Buxton*

Pinto, A. R. O tratamento da doença do sono com o Arsobal. Nota prévia. [**Treatment of Sleeping Sickness with Arsobal**] Reprinted from *Bol. Cultural Guiné Portuguesa*. 1952, Apr., No. 26, 235–7.

The author treated 15 early cases of sleeping sickness in Portuguese Guinea with a single dose of 4 mgm./kgm. of Arsobal ; trypanosomes disappeared from the blood within 24 hours, and the cerebrospinal fluid, which was normal before treatment, remained so when examined one month and 4 months after the treatment. Two patients had a short attack of colic soon after the injection, and 10 had slight albuminuria ; apart from this the injection was well borne.

J. F. Corson

See also p. 377, Goodwin, **The Chemotherapy of Malaria and Trypanosomiasis.**

Barrett, P. A., Curd, F. H. S. & Hepworth, W. **The Synthesis of Trypanocides. Part I. Some Pyrimidylaminoquinoline Derivatives.** *J. Chem. Soc.* 1953, Jan., 50–58.

Ainley, A. D., Curd, F. H. S., Hepworth, W., Murray, A. G. & Vasey, C. H. **The Synthesis of Trypanocides. Part II. 4-Amino-6-(2-Amino-1 : 6-Dimethylpyrimidinium-4-Amino)-1 : 2-Dimethylquinolinium ("Antryeide") Salts and Related Compounds.** *J. Chem. Soc.* 1953, Jan., 59–70.

Woolfe, G. **The Trypanocidal Action of Phenanthridine Compounds. I.—Derivatives of Dimidium with Changed Quaternizing Groups.** *Ann. Trop. Med. & Parasit.* 1952, Dec., v. 46, No. 4, 285–8.

"1. Analogues of dimidium bromide in which the methyl quaternizing group is replaced by longer chains were tested for trypanocidal activity in mice.

"2. The ethyl, *n*-propyl and allyl compounds were found to be far more effective than dimidium bromide against *Trypanosoma congolense*, *T. brucei*, *T. gambiense* and *T. rhodesiense*. Activity declined with longer chains, until the *n*-hexyl compound was no more active than dimidium.

"3. The more active compounds were somewhat less toxic to mice than dimidium, and caused less tissue damage in rats.

"4. The ethyl, *n*-propyl and allyl compounds have been submitted for field trial against bovine trypanosomiasis."

Pessôa, S. B. & de Freitas, J. L. P. Aspectos morfológicos do *Trypanosoma cruzi* e de outros parasitas de importância no diagnóstico da moléstia de Chagas. [**Morphology of *T. cruzi* and of other Parasites in Relation to the Diagnosis of Chagas's Disease**] *Folia Clin. et Biol.* S. Paulo. 1951, Dec., v. 17, No. 2, 175–90, 26 figs. [12 refs.]

In this note the authors stress the importance, for the diagnosis of Chagas's disease, of detecting the presence of and identifying *Trypanosoma cruzi* in the body fluids and tissues of the patient. In this connexion, attention is drawn to the differential diagnosis of this trypanosome from other human protozoa found in South America, which parasitize the same sites and may be mistaken for stages of *T. cruzi*. Thus, *T. rangeli* in the blood and *Leishmania braziliensis* in fixed tissues may be mistaken for the trypanosome and leishmanial stages of *T. cruzi* respectively. However, in both these sites *T. cruzi* can be recognized by the large size of its kinetoplast. There is also a superficial resemblance between the leishmanial forms of *T. cruzi* and *Toxoplasma* or *Sarcocystis* " cysts " in the muscles, but the presence of a kinetoplast in the parasites will serve to exclude these Sporozoa. The same structure can be used to differentiate both *T. cruzi* and *Leishmania* from *Histoplasma* in the liver.

These points are illustrated in 4 photographs and 22 photomicrographs.

C. A. Hoare

FEVERS OF THE TYPHUS GROUP

Giroud, P. & Gaillard, J. A. Peut-on différencier les divers types de rickettsies par simple inoculation à l'animal et dans l'oeuf ? [**Can the Rickettsiae be Differentiated simply by Animal Inoculation and Yolk-Sac Culture ?**] *Bull. Soc. Path. Exot.* 1952, v. 45, No. 6, 763–9.

The authors state in general terms the results of inoculating laboratory animals and yolk-sac cultures with the various human rickettsiae.

The rickettsiae are classified as belonging to the following 5 groups ; the numbers of strains studied are given in brackets :—epidemic (9 strains) ; murine (11 strains) ; boutonneuse, including *Rickettsia akari* (7 strains) ; Q fever (3 strains) ; and *orientalis* (3 strains).

Although the authors recognize that there is a wide range of variation in the responses to infection by different strains of the same group, and even to infection by the same strain in different conditions, they claim that information of the first importance for the differentiation of the organisms can be obtained from these experiments.

The inclusion of *R. akari* in the boutonneuse group is surprising ; apart from the fact that rickettsialpox is different in its clinical features from boutonneuse fever and is transmitted by a mite instead of by a tick, the authors themselves point out the following differences between *R. akari* and *R. conori*. The former cannot become adapted to pulmonary transmission in mice, and when inoculated intraperitoneally it causes considerable splenomegaly. Unlike *R. conori* it does not cause orchitic reaction in guineapigs and it can readily be passaged through the vitelline membrane of eggs.

[The descriptions of the special features of each group are given in concise terms and do not lend themselves to abbreviation. Sceptical readers are likely to doubt whether the differential diagnosis of the types by animal and

yolk-sac inoculation is likely to prove simple or precise except in the hands of experts who have special laboratory facilities at their disposal.]

John W. D. Megaw

NOURY, M. Recherches comparatives sur la diffusion des rickettsies sur le cobaye. [**A Comparative Study of the Rates of Diffusion of Rickettsiae in Inoculated Guineapigs**] *Bull. Soc. Path. Exot.* 1952, v. 45, No. 6, 721–3.

The author has already shown that the rickettsiae of murine typhus, when inoculated intraperitoneally into guineapigs, spread rapidly to the various organs and can be detected in these within 10 minutes [see this *Bulletin*, 1952, v. 49, 134].

In the present experiments it was found that the rickettsiae of epidemic typhus in similar conditions could not be recovered from the blood or organs of the guineapigs till the 3rd or 4th day.

Rickettsiae of boutonneuse fever were recovered from the blood of 1 of 4 guineapigs 10 minutes after inoculation ; from 1 of 2 after 6 hours ; from 1 of 2 after 24 hours ; and from the only one tested after 48 hours.

The findings are regarded as explaining the special frequency of laboratory infections with murine typhus and as helping to explain the predominantly neurotropic evolution of epidemic typhus fever. *John W. D. Megaw*

TAKEMORI, N. & KITAOKA, M. **Reversal of *p*-Aminobenzoic Acid Inhibition of Growth of Rickettsiae by *p*-Hydroxybenzoic Acid in Agar-Slant Tissue Culture.** *Science.* 1952, Dec. 26, v. 116, 710–11. [10 refs.]

The rickettsiostatic action of *p*-aminobenzoic acid (PABA) on agar-slant tissue cultures of the rickettsiae of murine typhus, Rocky Mountain spotted fever and rickettsialpox was found to be effectively neutralized by the addition of solutions of *p*-hydroxybenzoic acid (POB) in a concentration only 1–100 as strong as that of the PABA.

The rickettsia of Q fever and the virus of psittacosis were not found susceptible to the inhibitory action of PABA in concentrations of 200 mgm./100 ml., whereas the other 3 rickettsiae tested were susceptible to concentrations of 50 mgm./100 ml.

The authors point out the advantages of the agar-slant tissue-culture technique in the study of the growth requirements of rickettsiae and viruses.

References to previous work on the same lines will be found in the paper.

John W. D. Megaw

CIACCIO, G. Comportement des rickettsies pathogènes (*R. prowazeki*, *R. mooseri*) chez les poissons et les amphibiens. Leur localisation, la production des anticorps. [**The Reactions of Fishes and Amphibians to Inoculation with *Rickettsia prowazeki* and *R. mooseri***] *Ann. Inst. Pasteur.* 1952, Dec., v. 83, No. 6, 825–8.

P. GIROUD and the author have already shown that the rickettsiae of murine typhus could undergo development in three species of fishes [this *Bulletin*, 1949, v. 46, 625].

In the present study 2 species of fishes and 3 of amphibia were inoculated intra-abdominally with suspensions of mouse lungs infected with *Rickettsia prowazeki* and *R. mooseri*. Details of the experiments will be found in the paper by those interested. The chief conclusions reached were that both fishes and amphibians became infected, as was shown by the development of specific agglutinins and by the reactions of guineapigs and rabbits to inoculation with

blood and organs of the inoculated subjects. With *R. mooseri* the test guineapigs often showed pronounced Neill-Mooser reactions and their sera agglutinated the homologous rickettsiae at titres of 1–80 to 1–280. Two passages were made through the fishes but only one through the amphibians. In a table the results of immunity tests of 7 guineapigs infected with fish strains are shown ; 6 are described as non-immunized and only one as immunized.

John W. D. Megaw

EVANS, F. C. & SMITH, F. E. **The Intrinsic Rate of Natural Increase for the Human Louse,** *Pediculus humanus* **L.** Reprinted from *Amer. Naturalist.* 1952, Sept.–Oct., v. 86, No. 830, 299–310. [11 refs.]

The lice were kept at about 29·5°–30·5°C. and a relative humidity of between 30 and 55 per cent., usually near the latter value. They were fed for 15–20 minutes twice daily on human volunteers. Observations were accumulated on the length of life of adults, their reproductive abilities and the duration and survival of the eggs and the 3 larval stages. The mean duration of adult life was 17·64 days for males, and 17·57 days for females (maximum survival for adults—43 to 46 days), the data being derived from 400 lice of each sex. Females produced, on the average, 81·5 eggs in a life-time, laying none usually on the first day, two on the second day and up to about 5 a day by the fifth day. Thereafter, this rate of production was more or less maintained each day. Nearly 88 per cent. of the eggs hatched in 5–12 days (mean 8·01 days). About 86 per cent. of 804 larvae matured successfully to adults. The mean duration of larval stages in days was 5·23 (first larva), 3·40 (second larva), 4·18 (third larva). The mean intervals between moults were 5·23, 8·63 and 12·81 days.

From this sort of data a life-table is constructed, which shows the probability at birth of a female louse (that is, when she is but a freshly laid egg) being alive at any age (at one-day intervals) up to the 68th day ; and, also, the average number of eggs (female eggs only) to be expected from a female louse during any one of the days after it has become an adult louse, *i.e.*, from the 22nd day of its life and for, at most, a further 45 days. The gross reproduction rate is the total of female eggs possible from a female living the whole of the computed reproductive life of a louse (45 days). The actual value derived from the data is 113·8 eggs. Further figures are derived : thus, the net reproductive rate is about 31, which means that there is a 31-fold increase per generation ; the mean length of time for a generation is 30·9 days. By further mathematical derivation an intrinsic rate of increase is obtained. This shows that the population increases at the rate of 0·111 of an individual per individual per day, and that a louse population should double in numbers every 6·24 days. It is also calculated that a population, under the conditions studied, would have a stable age distribution of 5·69 per cent. adult ; 26·4 per cent. larvae ; and 67·88 per cent. eggs.

The paper then discusses these parameters and conclusions and compares them with similar findings in the literature for *Rattus norvegicus*, *Microtus agrestis*, and two grain beetles, *Tribolium castaneum* and *Calandra oryzae*.

The principal indications emerging from this discussion are briefly : the rodent habitats, especially for the vole, are better suited to the survival of the individual than is the case for the 3 insect species in their particular environments. The net reproductive rates of the insects are 31 (*Pediculus*), 114 (*Calandra*), and 275 (*Tribolium*) from which it is interpreted that since the louse has only a rather low potentiality for reproduction its natural environment must be considered as remarkably secure and suited to the survival of the individual louse. On the other hand, the survival of the individual in the case

of the beetles must be less assured. [This appears to be a reasonable conclusion for the louse which, excluding former and modern methods of hygiene, lives in a favourable stable environment in the absence of inter-specific competition apart from the attentions of the human host, which may be negligible, and, at times, the risk of fatal effects from rickettsial infection.] *D. S. Bertram*

Bunn, R. W. **Effectiveness of DDT in the Control of Body Lice in Germany.** *U.S. Armed Forces Med. J.* 1953, Feb., v. 4, No. 2, 243–7, 1 fig.

"Laboratory tests on 5 strains of body lice collected in Germany indicate that the standard Army 10-percent DDT powder will achieve effective louse control. There is evidence, however, that the louse strains tested are somewhat less susceptible to DDT than is the Orlando laboratory strain."

Greiff, D., Chiga, M., Blumenthal, H. T. & Pinkerton, H. **The Effect of X-Radiation on the Multiplication of *Rickettsia mooseri* in Embryonate Eggs.** *J. Exper. Med.* 1953, Jan. 1, v. 97, No. 1, 139–44. [10 refs.] [This summary appears also in *Bulletin of Hygiene*.]

"The multiplication of *Rickettsia mooseri* in fertile eggs is speeded up and quantitatively increased by single dose x-radiation given either 24 hours before or 48 hours after inoculation. This effect is noted at all dosage levels studied, ranging from 100 to 1500 r. The rickettsiostatic effects of high incubation temperature (40°C.) and of streptomycin are neutralized by radiation, but the rickettsiostatic actions of PABA, penicillin, and aureomycin are not altered. Possible mechanisms of action and implications of the observed effects are discussed."

Parker, R. R., Bell, J. F., Chalgren, W. S., Thrailkill, F. B. & McKee, M. T. **The Recovery of Strains of Rocky Mountain Spotted Fever and Tularemia from Ticks of the Eastern United States.** *J. Infect. Dis.* 1952, Nov.–Dec., v. 91, No. 3, 231–7, 1 fig.

The survey described in this paper was made in 1939–1940 and was presumably directed by R. R. Parker, whose death in September, 1949, was a very great loss to rickettsial research. No explanation is given of the great delay in submission of the paper for publication in April, 1952.

Ticks were collected from various localities in Pennsylvania, Virginia, West Virginia, New York, Connecticut, North Carolina, and Alabama.

From 91 groups, comprising 3,368 specimens of *Haemaphysalis leporis-palustris*, 6 strains of Rocky Mountain spotted fever and 3 strains of tularaemia were recovered. From 83 groups and 2,201 specimens of *Ixodes dentatus* 1 strain of Rocky Mountain spotted fever and 1 of tularaemia were recovered. All the strains of tularaemia were recovered from one county in Virginia.

This is said to be the first time that strains of Rocky Mountain spotted fever capable of being maintained in serial passage through guineapigs have been isolated from *H. leporis-palustris*, which is regarded as a probable natural vector of infection, though conclusive evidence is lacking.

All the 7 strains of Rocky Mountain spotted fever were confirmed, by their ability to immunize against virulent strains of infection recovered from *Dermacentor andersoni*, by the fact that guineapigs inoculated with tissue-culture vaccines of Rocky Mountain spotted fever were found immune against the strains, and by the fact that their cultures in chick embryos were similar to those of standard Rocky Mountain strains.

The strains differed from the highly virulent rickettsiae recovered from *Dermacentor andersoni* in Western Montana in their low virulence for guineapigs

and the rarity of scrotal lesions in these animals ; correspondingly they agreed in these respects with the typical strains isolated from *Dermacentor variabilis*.

John W. D. Megaw

TENDEIRO, J. Nota prévia sobre febre Q. [**A Preliminary Note on Q Fever**] *Gaz Méd. Portuguesa.* 1952, v. 5, No. 4, 645–9, 4 figs. English summary.

The author reports the isolation of strains of *Coxiella* [*Rickettsia*] *burneti* from various ixodid ticks, and from samples of cows' and goats' milk, in Portuguese Guinea.

The strains isolated were as follows : from ticks, mostly *Amblyomma variegatum* collected from cows, 8 strains ; from a dog tick (*Rhipicephalus sanguineus*) 1 strain ; from ticks of wild animals, 4 strains ; from birds, 4 strains ; and from reptiles, 3 strains.

The author states that in experimental Q fever the characteristic micro-colonies of rickettsiae found in smears of organs have a diagnostic significance equal to that of the Negri bodies in rabies. The high cost of the commercial antigen is said to have prevented the use of the rickettsia-agglutination test in routine investigations. The great virulence of local strains for small laboratory animals necessitated the employment of monkeys for immunity tests.

John W. D. Megaw

MALLOCH, R. A. & STOKER, M. G. P. **Studies on the Susceptibility of *Rickettsia burneti* to Chemical Disinfectants, and on Techniques for detecting Small Numbers of Viable Organisms.** *J. Hygiene.* 1952, Dec., v. 50, No. 4, 502–14, 4 figs.

The authors have investigated the susceptibility of the Henzerling strain of *Rickettsia burneti* to phenol, commercial formalin, " Lysol " (B.P.), " Dettol " (para-chlor-meta-xylenol), " Cetavlon " (cetryltrimethyl ammonium bromide with a detergent), and anaesthetic ether.

The rickettsiae used in the tests were contained in titrated suspensions of heavily infected yolk sacs. For detecting the survival of rickettsiae, inoculation of guineapigs, mice, or yolk sacs gave similar results with single-passage tests, but the greater ease of sub-passages through yolk sacs led to the choice of this method for the detection of small numbers of the organisms ; in most of the experiments 2 sub-passages were made. The chemicals were allowed to act on the suspensions for 3 hours at 22°C.

Phenol, 0·5 per cent., had little effect ; at 1·0 per cent. it caused a thousand-fold reduction in infectivity but did not completely sterilize. " Cetavlon ", 0·5 per cent., was slightly more effective than phenol, but at 1·0 per cent. the action was not greatly increased. Formalin was more effective than the above but at 1·0 per cent. 2 of the 13 test eggs showed evidence of infection in the first passage. " Dettol " had much the same activity as formalin. " Lysol " was much more potent and at 0·5 and 1·0 per cent. 2 blind passages were needed to show the survival of rickettsiae. Ether treatment, as used in purifying rickettsial vaccines, was very effective but it failed to cause complete sterilization.

At a temperature of 37°C. for 3 hours the action of " Lysol " was enhanced and no viable organisms could be isolated after 3 egg passages.

It appeared from the findings that a few rickettsiae may be expected to survive in Q fever vaccines prepared in the usual way, even when purification with ether is carried out, but it is considered doubtful whether the few surviving rickettsiae would be dangerous ; immunologically they might even be useful.

Viable rickettsiae were found in crude smallpox-vaccine pulp harvested from sheep and treated with 1·0 per cent. phenol in the usual way, after contamination with living cultures of *R. burneti*. It may, therefore, be desirable to

test animals intended for the preparation of vaccine lymph to exclude the presence of Q fever antibodies. *John W. D. Megaw*

SIEGERT, R., SIMROCK, W. & SCHWEINSBERG, H. Q-Fieber-Studien. 2. Mitteilung. Zeitliche Entwicklung und Verweildauer komplementbindender und agglutinierender Antikörper bei unbehandelten und behandelten Q-Fieberpatienten. [**The Time of Appearance and Duration of Persistence of the Complement-Fixing and Agglutinating Antibodies of Q Fever in Treated and Untreated Patients**] *Zent. f. Bakt.* I. Abt. Orig. 1953, Jan. 24, v. 159, No. 3, 159–69, 6 figs. [33 refs.]

The authors describe studies of Q fever in continuation of those referred to in this *Bulletin*, 1952, v. 49, 499.

The present investigation deals with the time of appearance and persistence of the complement-fixing and rickettsia-agglutinating antibodies of the disease. The influence of treatment by modern antibiotics on the development of the antibodies is also studied.

The unhappy name " Queensland fever " is given to the disease by the translators of the summary into English and French ; the authors have adhered to the correct nomenclature in the text and the German summary.

The patients investigated formed a well-defined group of laboratory workers and attendants who became infected while handling the " Herzberg ", " Henzerling " and " Zurich " strains of *Rickettsia burneti*. In all the 37 cases the diagnosis was fully confirmed and the rickettsiae were recovered from 18 of the patients. Treatment by aureomycin or terramycin was given to 12 of the patients, the total dosage ranged from 2·5 to 8·0 gm.

In a group of 12 untreated patients complement-fixation tests were made in each of the first 4 weeks of the illness and at later dates. In the 1st week all were negative ; in the 2nd week only one patient reacted, at a titre of 1–40 ; in the 3rd week most of the patients reacted at titres of 1–20 or over, and in the 4th week all reacted, the geometric mean titre being over 1–40. The peak titre was reached between the 5th and 10th weeks ; by the 20th week it had fallen appreciably. In some cases diagnostic titres persisted indefinitely. There was a significant correlation between the duration of the illness and the titre of the reaction ; when the fever lasted less than 5 days the average titre was below 1–40 ; when the duration was more than 10 days the average exceeded 1–320. For cases classed as mild, moderate, and severe, respectively, there was a similar correlation of the average titres.

The geometric mean titre of 6 patients treated with aureomycin or terramycin starting from the 1st to the 4th day of the illness, was about 1–60 by the end of 2 months ; for 6 patients whose treatment started later it was over 1–160.

In a group of 15 patients tested at 8 weeks the titres ranged from 1–20 to 1–640 ; in the same patients after 2 years the range was from 0 to 1–80 and it remained the same after 3 years. The number of patients with negative reactions after 2 years was 3 ; it remained the same after 3 years.

The results of the micro-agglutination tests are briefly described. Even with homologous antigens positive reactions did not occur in the great majority of cases till the 4th week ; the maximum titres were usually reached in 6–8 weeks and these averaged only one-fifth to one-tenth those of the fixation test. Among 10 patients tested after 1 year the titres were 1–4 or negative ; and among 20 patients tested after 2–3 years there was only one positive reaction.

The findings are fully discussed in the light of the results reported by other workers, and these are documented so that the paper is a valuable source of information on the serological tests for Q fever. *John W. D. Megaw*

YELLOW FEVER

ELTON, N. W. **Progress of Sylvan Yellow Fever Wave in Central America ; Nicaragua and Honduras.** *Amer. J. Pub. Health.* 1952, Dec., v. 42, No. 12, 1527–34, 1 map. [20 refs.]

The progress of the epizootic and epidemic of yellow fever southwards through central America has already been described [this *Bulletin*, 1950, v. 47, 1078 ; 1952, v. 49, 684] and the account is here continued. The disease in monkeys is fatal, the animals having the characteristic pathological picture of yellow fever. The epizootic is moving as a wave at the rate of about 13 miles per month and taking about 2 months to pass a given point. Its course is controlled by natural physical barriers and it is now confined to the Atlantic side of the isthmus ; the nature of these barriers is described. Starting in eastern Panama in late 1948 the wave has passed through Panama and Costa Rica and has now reached Nicaragua where it is north-east of Lake Nicaragua. The epizootic seems to burn itself out and has not doubled back along itself. The human epidemics tend to occur during wet seasons but have not affected the major towns where *Aëdes* control has been carried out. From the time of realization of the wave form, predictions have been made of its movement and these have been substantially correct. It is now thought that the wave will move northwards through Honduras, Guatemala, British Honduras and Mexico.

A project has been made to block this progress at a place where natural barriers will narrow the channel of movement, and which the epizootic is expected to reach about July 1954 [see below, 1953, p. 402] ; the author pleads for the implementation of this project. *G. Macdonald*

ELTON, N. W. **Anticipated Progress of Sylvan Yellow Fever in Nicaragua : Plan for Attempt to block its Course in Honduras.** *Military Surgeon.* 1952, Sept., v. 111, No. 3, 157–62, 1 map.

The course of the epizootic of yellow fever in Central America has been reported elsewhere [see above, 1953, p. 402]. The present paper briefly re-states it and discusses a plan to block its progress at a point in northern Honduras where it is expected to be forced into a relatively narrow course, and which it is expected to reach in mid-1954. The plan proposed is :—

1. Establishment of a barrier zone about 10 miles wide just east of La Ceiba, extending from the coast line southward or south-westward across the mountain mass and across the headland of the Aguan valley.

2. Extermination of arboreal mammals in the barrier zone by systematic hunting and trapping.

3. Establishment of sentinel zones likely to be involved by the wave as it approaches the barrier zone, in which the wild life is undisturbed but kept under constant surveillance for evidence of the arrival of the epizootic among the arboreal mammals.

4. Taxonomic and bionomic studies of canopy mosquitoes in the sentinel zones and the barrier zone prior to the use of DDT, and in the barrier zone during its use.

5. Airplane spraying of forest with DDT in the barrier zone, supplemented by the use of DDT fog and ground-operated sprays to kill local canopy mosquitoes before arrival of the wave, with intensification of the operation as the wave approaches, to kill mosquitoes drifting into the zone from the infected side.

Execution of the plan would require careful previous study of the movement of the epizootic, for which specific recommendations are made.

[It is understood that these proposals have not yet been accepted by any official body.] *G. Macdonald*

Dick, G. W. A. & Horgan, E. S. **Vaccination by Scarification with a Combined 17D Yellow Fever and Vaccinia Vaccine.** *J. Hygiene.* 1952, Sept., v. 50, No. 3, 376–83.

Two groups of 25 African women were inoculated, one by scarification with a mixed vaccine of 17D yellow fever virus and vaccinia, made up with gum arabic, and the other by inoculation subcutaneously with 17D vaccine followed by scarification with vaccinia vaccine.

Response to vaccinia was alike in the two groups ; but the second method was clearly preferable for 17D vaccination, for 22/22 women with no initial neutralizing antibody developed some after vaccination by this method, whereas, after vaccination by the first method, only 14/21 did so.

Neither method produced reactions. Preliminary tests on mice failed to reveal any deleterious effect, on the yellow fever vaccine, of the phenol and glycerin in the vaccinia vaccine. *E. T. C. Spooner*

Nájera, L. E. La vacunación antiamarílica. [**Yellow Fever Vaccination**] *An. Med. Pública.* Santa Fe. 1952, Jan.-June, v. 4, Nos. 1/2, 53–68. [19 refs.]

A general review and discussion.

DENGUE AND ALLIED FEVERS

Florio, L., Miller, Mabel S. & Mugrage, E. R. **Colorado Tick Fever. Recovery of Virus from Human Cerebrospinal Fluid.** *J. Infect. Dis.* 1952, Nov.–Dec., v. 91, No. 3, 285–9.

The results of a large series of experiments " are all consistent with the conclusion that the virus of Colorado tick fever is found routinely in the cerebrospinal fluid of individuals with this disease ".

Blood and cerebrospinal fluid of 7 patients with typical attacks of the disease were passaged 9 to 12 times through hamsters, of which 485 were inoculated and 128 others were controls, inoculated with normal blood and spinal fluid. The most obvious reaction of the hamsters to infection was leucopenia the significance of which had already been described by the authors [see this *Bulletin*, 1945, v. 42, 118]. Other tests employed were : complement fixation ; comparison of minimal infective doses of blood and spinal fluid ; neutralization ; and cross immunity. With all these tests blood and spinal fluid gave almost identical responses. *John W. D. Megaw*

RABIES

REAGAN, R. L., DAY, W. C. & BRUECKNER, A. L. **Rabies Street Virus Strains in the Syrian Hamster and in the Swiss Albino Mouse.** *Proc. Soc. Exper. Biol. & Med.* 1952, Dec., v. 81, No. 3, 654–6.

"1. Hamsters and mice were challenged intracerebrally and hamsters rectally with 14 strains of rabies street virus in order to determine the better species of animal and route of inoculation in diagnostic work for rabies. With 6 of the 14 strains the incubation periods in intracerebrally inoculated hamsters were shorter than in the mice. Although the incubation period was longer in the hamsters challenged rectally, no preliminary treatment to eliminate bacterial contamination was necessary. 2. Examination of stained touch preparations revealed that the Negri bodies in infected hamster brains were larger and more numerous than those in infected mouse brains."

REMLINGER, P. & BAILLY, J. La rage expérimentale du canard. [**Experimental Rabies in the Duck**] *Bull. Acad. Nat. Méd.* 1952, v. 136, Nos. 33/34, 564–7.

Stimulated by the discoveries of rabies strains of low pathogenicity for mammals by adaptation to the chick embryo, the authors have studied rabies in the duck (*Anas boschas*). Street viruses isolated from dogs, cats and sewer rats were compared with the Flury strain by intracerebral inoculation. Infection occurred in about one-third. Rabbit fixed virus was non-infective by this route. Birds refractory to one inoculation were not infected by further injections of the same or different strains. It is suggested that the first injection may immunize [or interfere ?].

The incubation period in ducks varied from 7 to 26 days. Paresis of legs and wings was followed by increasing lethargy and anorexia. Aphasia, tremors and spasmodic movements sometimes occurred. The course varied greatly : from a rapidly fatal form, to benign and often local paralysis, or to "*formes frustes*" where there was only mild paresis or ataxia. Furious or ascending types were not observed. Recrudescences and remissions occurred—the latter usually but not always temporary. Even apparently moribund birds have recovered. There was a chronic debilitating variety.

Negri bodies were found in only 5 birds (one infected with the Flury strain) usually in the posterior cerebral cortex or in the vermis of the cerebellum. They differed from those in mammals in apparently lacking the characteristic internal structure. They were round homogeneous eosinophile inclusions variable in size and sometimes vacuolated.

Intracerebral passage from ducks to rabbits or guineapigs was often negative even when death was undoubtedly due to rabies—in positive animals incubation was prolonged—once to as much as 40 days. [A Spanish version of this paper appears in *Med. Colonial*, 1953, v. 21, 5.] *C. E. Gordon Smith*

APPELBAUM, E., GREENBERG, M. & NELSON, J. **Neurological Complications following Antirabies Vaccination.** *J. Amer. Med. Ass.* 1953, Jan. 17, v. 151, No. 3, 188–91. [19 refs.]

Forty-six cases of neuroparalytic accident due to treatment with Semple-type vaccine [presumably rabbit brain] were reported in New York City from 1928 to 1951. Nearly 90 per cent. occurred during the second or third weeks after first injection (range 6–45 days). Three clinical varieties are described : (*a*) 37 *encephalitic* cases with sudden febrile onset, meningism,

etc. Motor and sensory changes, mostly in the lower limbs, and bladder disturbances were common. (*b*) 5 cases of *dorsolumbar myelitis*, slower in onset ; back pain was followed by paresis or anaesthesia in the legs, and bladder dysfunction. Three were spastic and two flaccid. (*c*) 4 *neuritic* cases : two sensory, one motor and one mixed.

Changes in the cerebrospinal fluid consisted mainly of predominantly lymphocytic pleocytosis. The cell count ranged from normal limits in 5 of 32 cases examined, to 1,260 per cmm. in one ; 60 per cent. of cell counts were between 10 and 100 per cmm.

Recovery was usual in two weeks. There were some relapses but no deaths. Follow-up varying from a few months to 10 years showed that 36 per cent. had sequelae but none sufficient to necessitate change of occupation.

Half the patients were aged 3–14 years ; 78 per cent. were males. Half had had 14 or more injections ; 73 per cent. had more than 7. " Accidents " occurred in 1 in 454 of those who had had 14 doses and in 1 in 2,190 of those who had had less than 8.

In New York from 1935 to 1948, 699 rabid animals are reported to have bitten 707 persons, of whom 699 received treatment. There were 6 human cases of rabies, and two of these patients had had treatment. The authors estimate that 35–106 cases of fatal human rabies were prevented at a cost of 41 non-fatal paralytic accidents.

Indications for treatment are discussed and the need for strict criteria emphasized. The possible future use of avianized vaccine and hyperimmune serum is mentioned. *C. E. Gordon Smith*

PLAGUE

POLLITZER, R. **Plague Studies. 7. Insect Vectors.** *Bull. World Health Organization.* Geneva. 1952, v. 7, No. 3, 231–342, 43 figs. [307 refs.]

This 7th instalment of the Manual of Plague in preparation by the author deals with the insect vectors of infection. The name insect is used in the popular sense ; mites and ticks are included among the possible vectors. The greater part of the article deals with rodent fleas, but other fleas, human lice, bed-bugs, mites, ticks, flies, mosquitoes, triatomata, ants, beetles, and cockroaches also receive attention.

The literature of the subject has been thoroughly explored, as is shown by the long list of 307 references. Every aspect of the natural history of the fleas of commensal and wild rodents is discussed, special attention being given to their distribution and to the exchange of fleas between the different types of rodents. The history of the discovery of the rôle of the rat flea in transmission is briefly described ; due credit is given to the early pioneer work of Ogata and Simond in 1897–98, and a summary is given of the " monumental achievements " of the Plague Research Commission from 1905 onwards. The mechanism of transmission by fleas and the part played by them as reservoirs of infection are ably discussed.

In an Annex a lengthy documented list is given of wild-rodent fleas found infected in nature or proved to be susceptible to experimental infection. Another very valuable Annex deals with the identification of some common fleas ; this has been submitted by G. F. A. M. SMIT, custodian of the great Rothschild Collection of Siphonaptera of the British Museum (Natural History) at Tring. This annex contains 43 clearly drawn figures illustrating the taxonomic characters of the 10 most important species of fleas. *John W. D. Megaw*

CHEN, T. H. **Studies on Immunization against Plague. IV. The Method of the Hemagglutination Test and some Observations on the Antigen.** *J. Immunology.* 1952, Dec., v. 69, No. 6, 587–96. [14 refs.]

The author describes a haemagglutination test for *Pasteurella pestis*. Details are given of the method of sensitizing the red cells of sheep by mixing them with the supernatant fluid of centrifuged broth cultures of *P. pestis* which had been incubated for 6–14 days. After 2-hours' contact the cells are collected by low-speed centrifugation and are washed 3 times in normal saline. Serum to be tested is first absorbed by contact with unsensitized red cells of a sheep to remove heterophile and anti-species antibodies.

A table shows the sensitiveness of the haemagglutination test as compared with the bacterial-agglutination and complement-fixation tests. With 7 hyper-immune rabbit sera the average titre of the haemagglutination reaction was slightly lower than the averages of the other two tests, but with 4 sera of immunized guineapigs it was much higher, reaching 1–64 in 3 of these sera whereas none of the other tests was positive at a titre of 1–32.

The haemagglutinating antigens were present, (*a*) in broth cultures 4 days old and upwards, (*b*) in extracts of killed and dried organism, and (*c*) in alcohol-precipitated envelope antigens ; they were absent from protein fractions soluble in 0·25 saturation of ammonium sulphate solution and from fractions, isolated by precipitation of soluble extracts by 0·3 or more saturated ammonium sulphate. The low nitrogen content of the crude antigen suggested that it is likely to be a polysaccharide. The antigen did not appear to have important immunizing properties ; mice inoculated with red cells loaded with the antigen showed no increase of resistance to *P. pestis*. *John W. D. Megaw*

MERCIER, S. & MAC CRUMB, F. R. Première guérison d'un cas de peste pulmonaire par la chloromycétine. [**The First Case of Cure of Pneumonic Plague by Chloromycetin (Chloramphenicol)**] *Méd. Trop.* Marseilles. 1952, Nov.–Dec., v. 12, No. 6, 693–7, 2 figs. & 1 chart.

The authors describe in detail the first case of pneumonic plague in which chloramphenicol has been shown to be curative. The patient, aged 60 years, was under close observation before the onset because of having been in contact with a fatal case of the disease so that his temperature was being taken every 4 hours. The treatment was started less than 16 hours after the temperature began to rise.

Details of the course of treatment have already been given by GIRARD [see this *Bulletin*, 1953, v. 50, 111].

Benefit from the drug was not immediately obvious ; for a few hours the clinical and radiological condition deteriorated in the usual way, but after about 12 hours the temperature began to fall and rapid improvement was observed.

The same treatment has later been given to 5 patients attacked by bacteriologically confirmed pneumonic plague ; only one patient died and his death was probably attributable to delay in starting the treatment.

John W. D. Megaw

MERCIER, S. & MAC CRUMB, F. R. Premières guérisons de cas de peste pulmonaire traités par la terramycine. [**The First Cases of Cure of Pneumonic Plague by Terramycin**] *Méd. Trop.* Marseilles. 1952, Nov.–Dec., v. 12, No. 6, 698–706, 2 charts & 4 figs.

Two cases of pneumonic plague are described in detail ; both were closely comparable to the one described in the preceding paper except that the

treatment was by terramycin, of which the first doses were given within 2 and 4 hours, respectively, of the onset. The dosage was the same as that of chloramphenicol except that the second and third intravenous doses were of 0·25 gm. each instead of 0·5 gm. The ages of the patients were 43 and 39 years, and the responses to treatment were more rapid, especially that of the younger patient who was definitely restored to health within 48 hours.

The authors state that terramycin ranks with streptomycin and chloramphenicol in the effective treatment of pneumonic plague. *John W. D. Megaw*

CHOLERA

SWAROOP, S., with the assistance of R. POLLITZER. **World Distribution of Cholera Endemicity.** *Epidemiological & Vital Statistics Rep. W.H.O.* 1952, Nov., v. 5, No. 11, 569–89, 4 figs. [14 refs.] [In parallel French & English.]

The cholera situation throughout the world is analysed from the point of view of describing the distribution of endemicity in the recent past and its trend. The basic epidemiological factors likely to be related to prevalence are also considered and the problem of persistence in certain areas.

No clear-cut definition of the term "endemicity" has been agreed upon in the case of cholera, but for practical purposes the term may be applied to areas where the disease continues to persist and may or may not assume epidemic proportions at times. The experience has been that in such areas it is, as a rule, not possible to trace the spread of infection from patient to patient either directly or through the agency of carriers, a sporadic incidence of cases unrelated to one another being the usual feature. In the circumstances the problem of cholera persistence might be studied by tabulating the figures of incidence over a prolonged period of years and assessing the length of periods in which cholera cases or deaths have been absent. There are, however, factors in assessment which might make the method unsatisfactory, such as the size of population units for which figures are available. A method suggested as preferable for measuring the level of endemicity is by ascertaining the average cholera death rate in an area during one-third of the years showing the lowest mortality from the disease. Figures obtained in that way would have comparative value only but the method would serve to show areas in which cholera is non-endemic; it would also indicate the comparative degree of endemicity in areas where, in the years of lowest prevalence, the death rate remains more or less high. Neither method would show changes in endemic status but considered in conjunction with the long-term trend, they would enable an evaluation of the situation in different areas to be made. The prevalence of cholera in various countries in the recent past is reviewed :—

Egypt.—Cholera is not endemic in Egypt. After an absence of 45 years an epidemic occurred in 1947 which lasted about three months, infection then disappearing completely. There was no westward spread to other countries. The method of introduction of infection was not ascertained.

India.—The most important world centres of cholera are in India (present-day India and Pakistan). The quinquennial average mortality figures show that although there have been irregular variations in incidence there has been a general downward trend since 1922. In incidence of cholera

" a distinction can be made between (i) large areas situated particularly in the northern, central and western provinces of India where the disease appears at times in epidemic form and (ii) certain other areas where cholera has a tendency to persist perennially and from which the infection apparently spreads to the ordinarily cholera-free areas ".

Bengal is recognized as the major endemic area but tendency to persist has also been shown in the southern districts of Madras Presidency, Assam, Bihar and Orissa. By a detailed examination of the figures available for individual districts it has been shown that the major endemic foci are restricted to 7 contiguous groups of districts. These have been classified in order of importance on the basis of their average cholera mortality rates per 100,000 for the 15 years recording lowest incidence of the disease during the period 1901–1945. The classification is as follows, with the average rates shown in parentheses :—

I. Howrah (125), Hooghly (64), 24-Parganas (120), Burdwan (47), Midnapore (61), Calcutta (92), Khulna (99), Jessore (85).
II. Mymensingh (72), Dacca (104), Sylhet (72), Tippera (99), Faridpur (97), Bakarganj (107), Noakhali (60).
III. Cuttack (81), Balasore (91), Puri (71).
IV. Patna (46), Gaya (51), Shahabad (31), Darbhanga (21), Muzaffarnagar (22), Monghyr (44), Bhagalpur (46), Ballia (18), Azamgarh (16), Gorakhpur (24), Basti (20), Banaras (16), Ghazipur (24).
V. Kamrup (40), Darrang (30), Goalpara (21).
VI. Tanjore (35), Trichinopoly (25), South Arcot (26).
VII. Kistna (6), West Godavari (19), Guntur (6).

The geographical location of the 7 groups of endemic foci is shown in an accompanying figure.

All have the following characteristics—

(1) they are located around rivers ;
(2) they are in areas with a high density of population ;
(3) they are situated in low-lying lands, none of the foci being more than 500 feet above sea level.

A more detailed study of the figures for the highly endemic area of south-west Bengal based on the figures for individual *thanas* (areas with an average of about 100,000 inhabitants) showed the chief foci of cholera endemicity to lie around the confluence of the Hooghly, Rupnarayan and Damodar rivers. It is considered that the examination of the figures for still smaller areas might contribute further to the knowledge of the problem of endemicity.

Burma.—The incidence of cholera in Burma was studied on the basis of the figures available for the years 1918–1938. During this period cholera was reported every year, the highest incidence being in Lower Burma. The average annual cholera mortality rates per 100,000 for the 7 years of lowest prevalence in the period were in the districts Myaungmya (9·43) Pyapon (7·29) and Ma-ubin (7·14). These districts are situated in the deltaic area at elevations of not more than 25 feet above sea level. The next in order are the adjoining districts of Rangoon (2·14) Hanthawaddy (2·14) Insein (1·86) and Bassein (1·71). A minor degree of persistence is shown in the Thaton district in the delta of the Salween river which gives a figure of 1·43. The levels are much lower than in the endemic areas in India. In 10 out of the 31 districts of Burma a zero figure is recorded. It is concluded that the main focus of cholera endemicity is in the low-lying area of the Irrawaddy delta.

Thailand.—The incidence of cholera in Thailand is of a different type. Epidemic periods of about 3 to 5 years' duration have occurred, followed by periods of negligible or no incidence of similar duration. The figures for

the 15 years 1936 to 1950 which were available for examination are considered insufficient on which to base a comparison of average incidence by the method employed but only four provinces gave rates higher than zero. These were, Chaninat (0·3), Nakhon Sawan (0·3), Nakhon Pathon (0·1) and Angthong (0·1), situated in the south along the river Chao Phya. Persistence even in that area is negligible as compared with that in the endemic deltas in India and Burma.

Philippine Islands.—Although in the past considerable epidemics occurred in the Philippines, cholera has been almost completely absent since the beginning of 1935. The disease is not endemic.

Japan.—Epidemics of cholera, due to importation of infection, were frequent in Japan in the earlier part of the century but there has been an almost total absence of the disease during the period 1930 to the end of 1945. This is attributed to careful control by the port health authorities. A small epidemic occurred in 1946 due to importation of infection by repatriated troops but there was no subsequent recurrence.

China.—Figures for the incidence of cholera in China which are fully suitable for statistical analysis, are not available and the evidence considered in the survey indicates the trend of the infection rather than the actual prevalence of the disease. Many major epidemics have occurred in the present century and it seems likely that endemic foci have become established in some parts of the country. In some areas, after an epidemic, a carry-over through one or more cold seasons may occur resulting in temporary endemicity and constituting the origin of more general spread in China at times. In the absence of more extended or more detailed figures the reported case incidence by region or province has been examined for the 10-year period from 1939 to 1948 and the endemicity levels calculated on the 5 years of least cholera incidence. The highest rates were in Kwangsi (0·56) Kwangtung (0·24) Fukien (0·24) and Hunan (0·18). Yunnan (0·04) was next in order. Of the 26 provinces 17 showed a zero rate. " It will be noted that the highest values were obtained for the two provinces of Kwangtung and Kwangsi, which lie in the delta of the Sikiang river. One contiguous zone of endemicity seems to have existed, which possibly extended from the coastal and deltaic regions of Kwangtung westwards to Yunnan and northwards along the coast into Fukien province.

" Cholera seems to have persisted to a comparatively minor degree in Hunan province, presumably round the Tungting lake near the Yangtze river, but the deltaic areas of the latter do not seem to have been as favourable for a persistence of the infection as the Sikiang delta."

The provinces for which the figures were available had populations which amounted in most cases to 10 or 20 million or even more and it is suggested that the examination of data for smaller sub-divisions might permit areas with a high level of cholera incidence to be delimited more precisely.

Asiatic Ports.—The relative level of endemicity in ports has been evaluated on the basis of the figures for 1926–1940. The mean attack rates per 100,000 in the 5 years of lowest incidence are, Calcutta 89·6, Chittagong 20·0, Bassein 10·0, Madras 2·3, Rangoon 1·2, Swatow 0·2, Bangkok 0·1, Shanghai 0·03, Bombay 0·03, and Canton 0·02. The highest incidence is shown in ports in recognized areas of high endemicity. Incidence in ports in China is very low in comparison. *J. Taylor*

AMOEBIASIS AND INTESTINAL PROTOZOAL INFECTIONS

Rizzotti, G. Le caratteristiche morfologiche dei trofozoiti di *Entamoeba histolytica* nelle feci umane, loro significato biologico e loro importanza pratica. [**Morphological Characteristics of Trophozoites of *E. histolytica* in Human Faeces. Their Biological Significance and their Practical Importance**] *Arch. Ital. Sci. Med. Trop. e Parassit.* 1952, Oct., v. 33, No. 10, 551–60. English summary (9 lines).

In a previous paper [see this *Bulletin*, 1953, v. 50, 308] Rizzotti has already dealt with certain aspects of this subject. The classical description attributes the following main characteristics to trophozoites of *E. histolytica* : clear line of distinction between ectoplasm and endoplasm ; hyaline ectoplasm ; granular endoplasm with no vacuoles or bacteria but sometimes containing red blood corpuscles ; a nucleus which is either invisible or shows only as a delicate ring of refractile granules ; active mobility which is either directional or perhaps limited to the extrusion of pseudopodia from the ectoplasm.

Many have described other forms, which show little or no mobility and have other characteristics similar to those of *E. coli*. Rizzotti believes that such cases indicate degenerative processes which have taken place in the *E. histolytica* trophozoite before this is discharged with the faeces.

The author points out that immobile trophozoites of *E. histolytica* invariably show inclusions of various kinds, including bacteria, while the precystic forms do not. He believes that in freshly passed stools *E. histolytica* trophozoites show varying degrees of resistance and vitality from patient to patient.

He has noticed that under the microscope, at temperatures of 22°–24°C., the typically mobile trophozoites of *E. histolytica* in a stool specimen first lose their directional progress and then show a gradually diminishing activity in the extrusion of pseudopodia which become progressively short and stumpy, before the organism loses all mobility. The nuclear details get gradually more distinct and the cytoplasm more granular, and bacterial inclusions become evident. The line of distinction between endoplasm and ectoplasm gradually fades, more especially if the laboratory atmosphere is somewhat raised (in the region of 30°C.). It is these changes, sometimes going on to complete disintegration, which may take place inside as well as outside the host, according to Rizzotti.

The chronic cases of amoebiasis, in the diarrhoea-free intervals, present a problem. The author recommends that cysts should first be looked for, by means of flotation technique, and he takes material when necessary directly from ulcerations, by proctoscopy. If these examinations fail definitely to demonstrate the typically lively trophozoites of *E. histolytica*, the author prescribes a daily saline and in the case of outpatients waits until after the third dose before undertaking the examination of the stools, which must be done on freshly passed specimens and may have to be repeated for a series of successive discharges. *J. Cauchi*

Baud, C. A. & Borer, F. Caractères ultrastructuraux et classification systématique de deux amibes parasites. [**Ultramicroscopic Structure and Classification of Two Parasitic Amoebae**] *C.R. Soc. Biol.* 1952, June, v. 146, Nos. 11/12, 834–5.

There is some controversy regarding the affinities of *Entamoeba histolytica* and *E. invadens*, the pathogenic amoebae of man and reptiles respectively, which are morphologically indistinguishable. Having previously shown that certain free-living amoebae differed in the submicroscopic structure

of the ectoplasm, the authors applied the same methods for the differential diagnosis of the human and reptilian entamoebae. This study was based on cultures of these amoebae, which were fixed with Schaudinn's fluid and stained with Grenacher's alcoholic borax carmine. These preparations were examined for birefringence under a polarization microscope, and the wave length retardations were measured with the aid of a compensator. It was demonstrated that both in *E. invadens* and in *E. histolytica* the birefringence of the outer layers of ectoplasm was negative in relation to the optical axis, but whereas in the former species the mean retardation was 24Å, in the latter it was 45Å, *i.e.*, almost twice as long. It was thus shown that the surface of the ectoplasm in both species is laminated, but in *E. histolytica* this layer is denser, more clearly orientated and probably thicker. The authors believe that these characters are sufficient to justify the specific differentiation of the two amoebae. *C. A. Hoare*

Capocaccia, L. Sulla coltivazione dell '*Entamoeba histolytica*. [**Cultivation of *Entamoeba histolytica***] *Arch. Ital. Sci. Med. Trop. e Parassit.* 1951, Dec., v. 32, No. 12, 1110–39, 2 figs. [203 refs.] English summary (8 lines).

After a lengthy historical review of the cultivation of *Entamoeba histolytica*, the author describes the results of his own observations with two media : (1) a modification of Boeck and Drbohlav's medium consisting of Locke-egg-Ringer-serum, and (2) Difco " Endamoeba medium " with liver extract. The best results were obtained with the first medium, in which *E. histolytica* grew abundantly through 28–34 subcultures in the course of 50–70 days. The optimum *p*H was found to be between 7·4 and 7·6, though the amoebae could adapt themselves to growth between *p*H 7·2 and 8·2. The author's observations on the rôle of bacteria and rice in the cultivation of *E. histolytica* are generally accepted. There is a bibliography of more than 200 references. *C. A. Hoare*

Lippi, M., Capocaccia, L. & Cao-Pinna, M. Ricerche sulla reazione di deviazione del complemento nell'amebiasi. [**Studies on Complement Fixation in Amoebiasis**] *Arch. Ital. Sci. Med. Trop. e Parassit.* 1952, Nov., v. 33, No. 11, 605–18. [42 refs.]

The English summary appended to the paper is as follows :—

" The authors have performed the complement fixation test on 27 cases of amebiasis (8 acute and 19 chronic), on 30 controls, on one case of amoebic hepatitis, on 3 cases with trophozoites of Entamoeba histolytica in the stools without any clinical sign, on 33 individuals once suffering from amebiasis, and 6 with intestinal, but not amoebic, disorders. The antigen used was an alcoholic extract from Entamoeba histolytica cultures. The technics used were Kolmer's and Bengston's ones. From the data the authors do not assign reliable value to the test, as it has been negative in the great number of the acute cases and positive in a percentage not remarkably different from that of the controls."

Freedman, M. J. & Cleve, E. A. **Parenchymal Amebiasis : a Clinical Study.** *Amer. J. Med. Sci.* 1952, Dec., v. 224, No. 6, 659–66, 3 figs. [18 refs.]

In view of the ubiquity of *Entamoeba histolytica* infection and of the claim that 20 per cent. of those suffering from it develop extra-intestinal lesions due

to the parasite (PALMER, *Amer. J. Trop. Med.* 1946, v. 26, 543) records of these complications are of immediate interest. In a series of 1,000 cases of amoebiasis in India 56 per cent. of the patients have been stated to suffer from amoebic hepatitis or amoebic liver abscess [this *Bulletin*, 1945, v. 42, 381]. The present authors record details of three cases of hepatic amoebiasis they have seen and treated in the United States. Amoebic abscesses of the lung may result from direct extension of an hepatic amoebic infection through the diaphragm and pleura, or they may be due to embolic spread of the organisms through blood vessels. Pulmonary amoebiasis is stated to follow in 5 to 10 per cent. of cases of amoebiasis of the liver. An example due to direct extension from the liver is described. Amoebic abscesses of the brain are rare ; they usually are associated with an infection of the lung or liver ; an example of such an abscess, diagnosed at post mortem, is given.

Gastro-intestinal complications of amoebiasis include perforation, most commonly of the caecum, the ascending colon, the rectum, the sigmoid colon or the appendix, in order of frequency. A case is cited in which there were numerous granulomatous lesions of the serosal and peritoneal surfaces of the large and small intestines and of the mesentery and omentum ; in addition there was " cicatricial stenosis " at the junction of the descending and sigmoid colons, which clinically simulated a neoplasm. [The reviewer would suggest that this was an example of amoeboma formation.] In another case a similar lesion was found in the transverse colon. Details are given of a case of peri-anal cutaneous amoebiasis [also apparently with amoeboma formation] and of the subsequent development of cutaneous amoebiasis around a colostomy opening made in this patient to relieve the former condition.

The secondary bacterial colitis [post-dysenteric colitis] which may be superimposed on untreated relapsing amoebic dysentery is described by the citation of an illustrative case ; the development of a syndrome resembling acute appendicitis is mentioned, attention being directed to the disastrous results of surgical interference in such cases. The excellent results following prompt and effective specific treatment of extra-intestinal amoebiasis with emetine are fully appreciated, and therapeutic diagnosis of this condition with this drug is strongly commended.

A. R. D. Adams

CARRERA, G. M. & SADUN, E. H. **Hepatomegaly in Human and Experimental Amebic Colitis.** *Amer. J. Trop. Med. & Hyg.* 1952, Nov., v. 1, No. 6, 962–5.

Most parasitologists and clinicians in the past have regarded " amebic disease of the liver " as referring solely to a state of parasitic invasion of the organ. During recent years, however, a number of them have begun to refer to a condition of hepatomegaly in association with intestinal amoebiasis, unassociated with amoebic infection of the liver. As this concept of liver enlargement in conjunction with intestinal amoebiasis is gaining popularity, it seems well to find what, if any, justification there is for it. Accordingly the weight of the livers obtained from 7 persons known to be suffering from intestinal amoebiasis, but free from amoebic or neoplastic liver involvement, have been determined at autopsy. These 7 livers were found to weigh slightly more than the livers of normal persons of corresponding body-weight and age. The livers of 18 young guineapigs successfully infected intra-caecally with *Entamoeba histolytica* were also found to be greater than those of control animals of corresponding age and weight. Histological examinations failed to reveal any hepatic lesions or other changes to account for the increase in weight.

A. R. D. Adams

Braun, H. A. & Stonehill, R. B. **Hepatic Amebiasis. Abscess and Probable Rupture into the Peritoneum with Survival.** *U.S. Armed Forces Med. J.* 1953, Jan., v. 4, No. 1, 119–25. [Refs. in footnotes.]

Report of a case.

Crosnier, R. & Darbon, A. Amibiase pulmonaire à forme de néoplasie métastatique. Action spectaculaire du traitement spécifique. [**Pulmonary Amoebiasis Simulating a Malignant Tumour. Spectacular Effect of Specific Treatment**] *Bull. et Mém. Soc. Méd. Hôpit. de Paris.* 1952, Nos. 34, 35 & 36, 1260–66.

Adams, A. R. D. **Treatment of Bowel Infections of the Tropics.** *Brit. Med. J.* 1953, Feb. 7, 308–11.

In America there is some agreement that sulphadiazine is therapeutically the most effective sulphonamide for the treatment of the bacillary dysenteries, but it is recommended that dehydration must be corrected and the urine rendered alkaline prior to its use. There has been little evidence of the development of sulphonamide resistance by dysentery bacilli, but in America it has occurred against a strain of Flexner Z. Streptomycin has been used ; given by the mouth it is not absorbed, so that it does not cause toxic side-effects, and it has some value in sulphonamide-resistant cases.

In the treatment of amoebic dysentery there are two stages—treatment of the acute attack, and eradication of the bowel infection. In the first emetine by intramuscular injection is still unequalled, but usually it will not sterilize the bowel of the infection, however unwisely the drug may be pushed.

It should not be inferred that a person is free from *E. histolytica* infection of the bowel until 10–12 daily specimens of stool are free from parasites.

For complete eradication the combined use of drugs is advocated. Diodoquin, even when given in large doses 3·5 gm. daily for 3 months, merely suppresses the parasite.

Adams has given 0·5 gm. of aureomycin by mouth every 6 hours for 10 days to 27 men, of whom 23 were eventually considered cured. The remaining 4 were subsequently sterilized by further aureomycin treatment combined with other amoebicidal drugs.

Forty-nine patients were treated with comparable doses of terramycin and 46 were considered cured. Success was finally obtained in 3 with this antibiotic in association with a 3-weeks' course of other amoebicidal drugs. No serious toxic side-effects were encountered. Mild pruritus was met. The results of treatment with aureomycin and terramycin appear encouraging. Their special value is evident in these few cases which have proved refractory to repeated courses of treatment with the older accepted amoebicidal drugs.

Philip Manson-Bahr

Allegra, G. & Jeropoli, Nicola. Azione della 5-7-dijodo-8-ossichinolina sull'amebiasi intestinale cronica e su di alcune sindromi polinfestive nell' apparato digerente. [**The Action of Diiodohydroxyquinoline (Diodoquin) on Chronic Intestinal Amoebiasis and on Certain Combined Protozoal Infections of the Bowel**] *Arch. Ital. Sci. Med. Trop. e Parassit.* 1952, Oct., v. 33, No. 10, 568–78. [60 refs.] English summary.

The authors report on their experience from using diiodohydroxyquinoline (diodoquin) [B.P.C. standard] in the treatment of 95 persons with amoebic infection ; 27 of these had a mixed infection. Each case is said to have been followed up for at least 2 years.

Three patients had acute disease, discharging blood and mucus, complaining of abdominal pain and showing pyrexia, asthenia and wasting. One of these had

an associated infection with *Giardia intestinalis*. Each was given 750 mgm. of emetine hydrochloride over a period of 12 days, followed by 6 diodoquin tablets (of 0·20 gm. each) daily for 20 days. These courses were repeated 6 times with intervening rests of 30 days a time. The patients were young and had returned from a short stay in India. The protozoa disappeared after the first course and were still absent 6 months and one year after all treatment had stopped. [It is not stated why exactly 6 successive courses were given.]

Twenty-six patients had diarrhoea with passage of mucus, tenesmus and impaired nutrition. [It is not clear whether the number with an associated infection—*Giardia* or *Trichomonas*—was 9, 8 or 7.] Thirteen were given one course of emetine and 2 courses of diodoquin ; at the end of the first course one patient still showed large numbers of *Trichomonas* which disappeared, however, after the second course of diodoquin. One patient with single infection had a relapse 3 months after stopping treatment. Another with mixed infection had an amoebic relapse after 5 months. The other 13 patients which included 3 with *Giardia* received 2 courses of diodoquin alone. One patient relapsed within 3 months, another within 4. A third patient showed a very resistant double infection and was only rid of his amoebae after 2 further courses, while *Giardia* was still present at the end of 7 months.

Thirty-five other patients were chronic cases with alternate constipation and diarrhoea and attacks of vague abdominal pain ; 13 also had *Giardia* and another had *Trichomonas*. All 35 were each given 3 courses of diodoquin separated by rest intervals of only 10 days. At the end of treatment, one patient was still discharging amoebic cysts and *Trichomonas*, 2 patients were still showing *Giardia* and 2 others continued to show amoebae in both cystic and vegetative forms. After 2 further courses of diodoquin (8 tablets daily for 15 days each time) only one of these patients proved resistant and was still discharging *Trichomonas*. This group showed "4 relapses in 9 months" [the meaning of this is not altogether clear].

The remaining 24 were symptomless excreters and were each given two courses of the drug (6 tablets daily for 15 days with 15 days rest) ; 2 of these had to have a third course to rid them of the associated parasite. There were 2 relapses [not clear if in the same patient] after 4 and 8 months respectively.

J. Cauchi

Blanc, F., Martin, M., Villa, T. & Mayan, L. Premiers essais de traitement des amibiases coliques par les iodiques solubles. [**First Trials of Soluble Iodized Compounds in the Treatment of Amoebic Colitis**] *Arch. Méd. Gén. et Trop.* 1952, Sept.-Oct., v. 29, No. 5, 193–224.

The authors have already reported the successful treatment of hepatic amoebiasis with soluble iodized compounds [this *Bulletin*, 1952, v. 49, 863]. They add that they have successfully treated some 50 patients suffering from hepatic amoebiasis with soluble iodized compounds, which they now use as a routine, in preference to emetine or conessine, in dealing with this complication. They noted that 4 patients so treated for secondary amoebic hepatitis were also cured of an amoebic colitis, and so were encouraged to determine the results of treatment with soluble iodized compounds of the various forms of amoebic colitis. Accordingly 31 patients with proven *Entamoeba histolytica* infections of the bowel were treated with "*l'iodhydrate d'hexaméthylène tétramine éthanol* (*I.H.T.E.*)". The daily dosage employed was 0·01 gm. of iodine for each kgm. of the patient's body weight, or 1·5 gm. of I.H.T.E. for a man weighing 60 kgm. ; a gross dosage of 9 to 10 gm. of iodine was given to each patient. The route of daily administration was usually intravenous by slow drip, 1·5 gm. of I.H.T.E. (or 0·6 gm. of iodine) being incorporated

in 500 ml. of isotonic fluid ; occasionally the drug was given orally, in the form of 12 tablets each containing 0·2 gm. There is a detailed account of each case and the dosage of the drug employed, together with the mode and duration of its administration. It is claimed that in all cases there was symptomatic and, apparently, parasitic cure of the infection ; it is to be noted that in all cases in addition to the iodized compound one or other of a number of antibiotics (penicillin, streptomycin, aureomycin, or terramycin) was given concurrently with the drug under test.

[On study of the records it will be observed that, in some cases at least, clinical relapse occurred within some days or a week or two of completion of the course of treatment and necessitated re-treatment ; and in some others it was deemed desirable to give a further course of treatment to " consolidate " the result.] *A. R. D. Adams*

i. Cosar, C. Étude de l'activité amoebicide expérimentale du *bis*-(*p*. arsonophénylamino)–1·2-éthane (4.763 R.P.). [**Experimental Study of the Amoebicidal Action of** *bis* (*p*. **arsonophenylamino)-1·2-ethane (4·763 R.P.)**] *Bull. Soc. Path. Exot.* 1952, v. 45, No. 6, 782–6, 1 fig.

ii. Schneider, J. & Dupoux, R. Traitement de l'amibiase intestinale par le *bis*-(*p*. arsonophénylamino) 1–2-éthane (4·763 R.P.). Premiers résultats cliniques. [**Treatment of Intestinal Amoebiasis with 4·763 R.P.**] *Ibid.*, 786–98.

i. During the last two years speculative compounds have been examined for therapeutic action on experimental amoebiasis in rats. This is an account of the results obtained with one of them, " *bis*-(*p*-arsonophénylamino)-1·2-éthane ", which has proved comparatively non-toxic and which constantly has shown marked amoebicidal properties. When given to mice subcutaneously, in the form of the disodium salt, the compound killed half the animals treated with a dose of 0·15 gm. per kgm. of body weight, expressed as the free acid ; by mouth 6 gm. per kgm. killed the same proportion. Rats tolerate a maximum dosage of 2·5 gm. per kgm. by mouth for 4 consecutive days. Experiments on rats and rabbits indicate that not more than 10 per cent. of the dosage given by mouth is absorbed, the extent of the absorption being determined by the amount of arsenic subsequently found to be excreted in the urine.

Young rats infected intracaecally with a fixed amount of a standard culture of *Entamoeba histolytica* were put on treatment 2 days after infection ; the drug was given orally, in the form of the sodium salt in a standard amount of aqueous solution, for 4 consecutive days ; 3 days after this the rats were killed and examined. Some 20 experiments, each including 6 to 8 untreated control animals and a variable number of treated animals, have now been done. The results are set out in a table and a block graph ; from these it appears that the compound in the lowest dosage used (0·15 gm. per kgm.), which is $\frac{1}{16}$ of the maximum tolerated dose, inhibits the activity of the infection ; a dose of 0·31 gm. per kgm. or more cures from 50 to 60 per cent. of the animals treated. These results, it is stated, are much superior to those obtained with other arsenical compounds, such as acetarsone and carbarsone.

To determine whether the drug exerts its action directly on the amoeba, or only against the associated bacterial organisms, *in vitro* comparative studies were made of the bacteriostatic action of this compound, another arsenical, some sulphonamides and aureomycin. There was no evidence of significant antibacterial effect of the arsenical compounds, whereas the sulphonamides and aureomycin were actively bacteriostatic.

ii. The authors have hitherto failed to find any drug which when given alone is effectively curative in human amoebiasis and reasonably free from side-effects. They now report a trial of "*bis*-(*p*. arsonophényl-amino) 1–2-éthane" on cases of human amoebiasis. This compound has already been shown by Cosar [see above] satisfactorily to control, and even to cure, experimental infections with *Entamoeba histolytica* in rats. Thirty-six persons in Tunis found to be suffering from this infection were treated, apparently orally, with the compound ; 57 similar patients were comparably treated at the Beaujon Hospital in Paris. Details are given of the probable places of acquirement of the infections, of the clinical types of disease resulting from them, of accompanying intestinal protozoal and helminthic infections, and of the end results of the treatment. The doses of the compound given to adults were from 2 to 2·5 gm. daily for 8 to 10 days, in some cases after a few initially smaller doses. There was no evidence of toxicity. The result of treatment was the disappearance of symptoms within a few days of beginning it, and shortly thereafter the disappearance of parasites from the stools in all cases in which the stools were regularly examined during the treatment. In those cases which were followed up it is claimed that there was no clinical relapse over the period of re-examination, which ranged up to some 3 months, and that parasites did not re-appear in the stools [but, on studying the records, it is apparent that in at least 2 cases parasitic relapse did occur after a single course of treatment, though a repetition of it seems to have produced sterilization]. Giardial and strongyloid infections were not cleared with any regularity by the treatment. *A. R. D. Adams*

LARSH, J. E., Jr. **The Effect of a Blacktongue-Producing Diet on Experimental Amebiasis in Dogs.** *Amer. J. Trop. Med. & Hyg.* 1952, Nov., v. 1, No. 6, 970–79. [24 refs.]

This investigation on experimental amoebiasis in dogs suffering from blacktongue, a deficiency disease, was undertaken because an analogous condition occurs in man, namely pellagra, also due to nicotinic acid deficiency, and both diseases have been widely studied. Since the amoebic lesions in man resemble to some extent those in the dog, it was thought that under the conditions employed the results might have some bearing on the human disease. The animals used weighed 5 to 10 kgm. and were kept under constant conditions for 2 months before experiment. They were freed from helminths and protozoa and after being matched approximately for sex and weight were divided into control and experimental groups and housed separately. The experimental group were put on a deficiency diet whose composition is given, while the control animals received in addition 10 mgm. nicotinic acid twice weekly by mouth. Records of weight were kept and when loss occurred as a result of impaired appetite in the experimental group, that animal and a control were infected by giving orally a salol-coated gelatin capsule containing trophozoites of *E. histolytica*. The blacktongue syndrome was controlled by giving small doses of nicotinic acid and a little riboflavin.

At selected times an experimental and control animal were killed and examination of liver and intestine was made with naked eye. Smears and scrapings from gut and cultures of intestinal contents were also made as well as a few sections for observations on the nature of the lesions. It was found from a study of 17 experimental and 17 control animals, that the former showed a much higher number of faecal samples with amoebae than the controls (approximately 90 and 40 per cent. respectively). Also the average prepatent period in experimental animals was about half as long as in controls. When animals were killed 3 to 10 weeks after infection, 80 per cent. of the experimental as opposed

to 60 per cent. of controls harboured *E. histolytica* and the amoebic lesions of gut in the former were much more numerous. The author concludes that absence of adequate amounts of nicotinic acid in this host is associated with lack of resistance to *E. histolytica*. " In addition, observations of one authority on pellagra suggest that these results might have a similar relationship in man."

J. D. Fulton

THOMAS, M. E. M. **Observations upon the Effects of Mepacrine and other Substances on** *Giardia intestinalis*. *Parasitology*. 1953, Jan., v. 42, Nos. 3/4, 262–8.

This investigation deals with the *in vivo* and *in vitro* effects of mepacrine and other substances on *Giardia intestinalis*. Eighty-two patients infected with this parasite were treated but, in spite of the presence of acute diarrhoea, vegetative forms of the parasite were seen in only 6 of them, while the remainder harboured cysts. The treatment consisted of daily doses of 0·05 to 0·3 gm. of mepacrine according to age, given orally for 6 days. Faeces were examined from 3 days after the end of treatment till at least 3 faecal specimens were negative before cure was assumed to have occurred.

The drug gradually produced a characteristic degeneration of the cysts over a period of 4 to 6 days. A similar result can be observed *in vitro*, the observations being made at intervals on faeces mixed with a solution of the substances under test kept in small screw-topped bottles at 20 and 37°C. Microscopic examinations were also made at intervals in saline, eosin or iodine solution. Mepacrine did not cause alteration of the cyst walls but shrinking of the contents occurred with yellow staining of the protoplasm. It readily affected vegetative forms, and rendered them non-motile. Caustic soda attacked the cyst walls but HCl did not at a concentration of 0·26 gm. per cent.—the upper limit of normal human gastric acidity. Alkaline detergents are recommended as good cleansing agents for premises and utensils. Dettol and lysol killed cysts within 30 minutes in 1 per cent. solution. The author believes that resistance of the cysts to different agents may vary with the age of the cyst.

J. D. Fulton

ELSDON-DEW, R., ROACH, G. G. & FREEDMAN, L. *Isospora belli* (**Wenyon**) **from Duodenal Intubation.** [Correspondence.] *Lancet*. 1953, Feb. 14, 348.

The authors point out that the exact source of the oöcysts of *Isospora* seen in the stools remains in doubt.

They then quote the case of a patient with nephritis, who was passing very large numbers of oöcysts of *I. belli* and a solitary *I. hominis*. Duodenal intubation revealed the presence of oöcysts in the duodenal juice and in the gastric contents : on a second occasion, the first specimen of gastric juice contained no oöcysts, but the duodenal fluid and a second suction of the gastric contents showed oöcysts of *I. belli*. On each occasion in which the oöcysts were found in the gastric contents, the latter were bile-stained.

The presence of the parasites in the duodenal fluid suggests that the site of infection may be duodenum or bile-tract. Many of the oöcysts were in the two-sporoblast stage which the authors find difficult to reconcile with their usual experience of *I. belli*, in which the parasites are immature on arrival in the stool : this is in contradistinction to *I. hominis*. It is suggested that some development may take place in the deeper tissues, as it does with *I. bigemina*.

H. J. O'D. Burke-Gaffney

RELAPSING FEVER AND OTHER SPIROCHAETOSES

ERCOLI, N. & CARMINATI, G. M. **Antispirochetal Interference between Antibiotics and Arsenoxide.** *Science.* 1952, Nov. 28, v. 116, 579–82. [23 refs.]

The antispirochaetal effect of penicillin, bacitracin, chloromycetin, and certain metallic compounds, but not that of streptomycin, aureomycin, terramycin, or subtilin, has been shown to be inhibited by BAL (dimercaptopropanol), which does not affect their antibacterial activity. The present authors have found that the antispirochaetal effect of arsenoxide was enhanced by certain antibiotics within limited ranges, but was inhibited by chloramphenicol, aureomycin, and terramycin, when their action on *Trep. duttoni* infections of mice were studied. It is of interest that these 3 antibiotics causing interference have a similar bacterial spectrum and like arsenoxide itself are highly active against the spirochaetes *in vitro*. The activity of the oxide and the 3 antibiotics taking part in the interference phenomenon was most strikingly reduced in the region of minimal effective doses. To explain the facts the authors suggest that interference results from competition between effective drugs for fixation on or penetration of the parasite, and that this elective fixation does not necessarily occur on the same receptors. Such a concept of a " differentiated and elective cellular absorption " is discussed at some length.

J. D. Fulton

LEPROSY

BROWN, J. A. K. **Leprosy in Uganda. Preliminary Investigations with special reference to Methods of Survey.** *East African Med. J.* 1952, Dec., v. 29, No. 12, 493–508, 1 map. [12 refs.]

Reference is first made to previous surveys of leprosy in Uganda [INNES, this *Bulletin*, 1951, v. 48, 160]. Seven sample surveys were made in the present study, 6 of them being on a line in the north of Uganda running from east to west, and the seventh further south. Most of them were near the border of the Belgian Congo. The results are set forth in 6 tables and show an incidence per thousand of 9·3, 7·0, 8·1, 4·5, 13·0 (sample), 19, and 22·2. An eighth survey was conducted by getting chiefs to bring in all suspected cases from various areas, which in two areas gave 7·5 and 7·2 per thousand. The scattered nature of the population makes such surveys particularly difficult, but the preliminary work recorded makes out a good case for further investigations.

Figures so far available indicate that leprosy is highest along the west of the country (116 to 118 per 1,000) where it borders on the Belgian Congo in which country the rate is correspondingly high, and in the east along the districts bordering with Kenya, where there is also a high rate. " Consideration of the two areas of highest incidence would suggest, if the figures are correct, that the Congo and Kenya have as much to fear from Uganda as Uganda has from them." There is a sudden fall in incidence from 116 to 6·1 in the south-west, and a trough of comparatively low incidence running from south-west to north-east, separating the two areas of highest incidence.

Ernest Muir

South Pacific Commission. **General Survey of the Local Leprosy Conditions in the British Solomon Islands Protectorate,** by J. C. Austin. Makogai, Fiji. Project H. 7, Report No. 2. 1952, July, 12 mimeographed pp., 1 map.

This interesting report is the result of a 2-months visit of Dr. Austin, Medical Superintendent of the Central Leprosy Hospital, Makogai, to the Solomon Islands under the British Protectorate. A previous 7-months survey made by Dr. Ross Innes in 1937/38 found the leprosy incidence at a little over 1 per cent., but much has happened since then, including the partial occupation by the Japanese " with its necessarily intense psychological effect as well as its probable periods of undernutrition ; the advent of overseas troops . . . their pockets bulging with comparatively useless money which they were ready to share with all . . . and the eventual return of the Civil Servant and trader, finding it difficult to keep even his own pockets lined ". This has led to non-cooperation with the government, especially in the central hilly parts of the islands where leprosy is most rife, and from where there is a constant danger of infecting the more developed inhabitants on the coast.

On Guadalcanal there is a Government leprosy hospital where the in-patient numbers are limited to 50, and which is cared for by 2 Sisters. There are also small settlements and leprosy villages on some of the islands supervised by various Missions. It is considered that any attempt to control leprosy by means of force would be useless. " It seems reasonable to assume that knowledge of the benefit being derived from modern treatment will gradually percolate through, even to the least cooperative areas, and produce a much better effect than a scheme forced upon them."

The New Zealand Lepers Trust Board is contributing large sums for leprosy relief and control in the Solomon and other islands. Four recommendations are made : the appointment of a leprosy Medical Officer to advise the Government on leprosy matters and supervise the anti-leprosy work generally ; more thorough training of Assistant Medical Officers and Dressers in leprosy work ; propaganda about new drugs in an attempt to encourage districts to set up their own leprosy centres ; and the appointment of a third Sister to Tetere, the Government Leprosy Centre, and the admission of more patients there.

Ernest Muir

de Souza-Araujo, H. C. **A Nonchromogenic Culture of an Acid-Fast Bacillus isolated from the Nasal Mucus of a Leprosy Patient ; its Virulence for Laboratory Animals.** *Internat. J. Leprosy.* New Orleans. 1952, July–Sept., v. 20, No. 3, 355–60, 4 figs. on pl.

The author describes the isolation, and cultivation from the nasal mucosa of a leprosy patient, of an acid-fast bacillus virulent for laboratory animals. It is non-chromogenic, strongly positive to the Dubos test, but does not produce tuberculous lesions in guineapigs. In guineapigs and black mice it produced general infection and considerable lesions. In the original culture it was chiefly coccobacillary, but became chiefly bacillary in guineapigs, black mice and a cebus monkey. Stained by the Fontes method the morphological structure is similar to that of Hansen's bacillus in fresh leproma emulsions. After re-inoculation into the cebus monkey nodules appeared on the left cheek where an injection had previously been made, and from this a growth, similar to the original culture, was obtained on Loewenstein's medium.

Ernest Muir

ROSEMBERG, J., SOUZA CAMPOS, N. & AUN, J. N. Da relação imunobiológica entre tuberculose e lepra. VI. Inversão da reação de Mitsuda com o BCG oral em indivíduos reiteradamente negativos à lepromina durante vários anos. [**Immunobiological Relation between Tuberculosis and Leprosy. VI. Inversion of the Mitsuda Reaction with Oral BCG in Individuals Constantly Lepromin-Negative for Several Years**] *Rev. Brasileira Leprologia.* S. Paulo. 1952, June, v. 20, No. 2, 67–74. English summary. VII. Influência do BCG oral sôbre a reação de Mitsuda em indivíduos previamente positivos à lepromina. [**VII. Influence of the Oral BCG Vaccination upon the Mitsuda Reaction on Previously Lepromin-Positive Individuals**] *Ibid.*, 75–83. [11 refs.] English summary. VIII. Positivação remota do Mitsuda por efeito da vacinação BCG oral. [**VIII. Remote Positivation of the Mitsuda Test resulting from Oral BCG Vaccination**] *Ibid.*, 84–96, 4 figs. English summary. IX. Reativação focal precoce da reação lepromínica, consequente à prova de Mantoux. (Nota prévia.) [**IX. Early Focal Re-Activation of the Lepromin Reaction, following the Mantoux Test. (Preliminary Report)**] *Ibid.*, 97–103, 2 coloured figs. English summary.

VI. In the first of these studies, 63 children of leprous parents, from 2 to 12 years old, all but 2 of whom had been isolated from their parents from birth, were found to be lepromin-negative, the test having been applied at yearly intervals from 1 to 6 times. The Mantoux test was also negative. Four doses of BCG were given orally at weekly intervals, the dose being 0·20 gm. Three days after the last dose the lepromin tests were repeated, the results being read on the 30th day. It was found that 31 cases had become Mitsuda-positive, though the Fernandez reaction [a weal showing within 48 hours] was negative in almost all cases. A second lepromin test, made 30 days later, brought the number of positives up to 60 (95·2 per cent.).

VII. In the second study, 40 children of leprous ancestry, all but 5 of whom had been separated from their parents at birth, were found all to have positive lepromin tests, but in 27 of them the reaction was only ±. The same dosage of BCG was administered as in the first study with the result that the strength of the lepromin results was increased in 35 out of 38 cases. The Fernandez reaction was positive in 25 (62·5 per cent.) ; this is in contrast to the BCG-induced positive lepromin test, in which, as noted above, it is almost always negative.

VIII. In the next experiment what is called " remote positivation " to the Mitsuda test is dealt with. In 63 children the lepromin test, performed at yearly intervals up to 5 times, had been uniformly negative. One year after the last Mitsuda inoculation they were given BCG oral vaccination as above [0·2 gm. 4 times at weekly intervals]. Twenty-four days after the beginning of vaccination another Mitsuda test was done, and this was positive at the 30-day reading. Also, in 10 cases there appeared simultaneously clear, infiltrative nodules on spots where former Mitsuda inoculations had been made with (at that time) negative results. In 7 of these there was only 1 remote positivation, in 2 there were 2, and in 1 there were 3 positivations. It was concluded that Mitsuda antigen, injected one or more years previously but still unabsorbed, had been " unchained " by the BCG from where it was stored in the dermis. Of 40 children, in whom the previous Mitsuda inoculations had given weak or medium reactions, there were 7 similar remote reactions after BCG vaccination. It was concluded that in these, the original reaction having been comparatively weak, all the lepromin had not been absorbed and thus under the effect of BCG there was " remote reactivation ". It is considered that the most important factor in determining remote reactivation is that of time, as in a previous contribution in 84·6 per cent. of cases administration of BCG had

begun 41 days after the lepromin inoculation and remote positivations had occurred between 70 and 112 days. Other less important determining causes are : the injection of lepromin not being entirely intradermal, variable quantity of lepromin injected, and local differences in the power of skin to absorb the lepromin.

IX. The last paper reports observations on 2 children of leprous patients who were separated at birth from infection. They were negative to both tuberculin and lepromin tests until they were 13 or 14 months old, at which age they were vaccinated with BCG. On the day of vaccination they were also lepromin tested, and gave strongly positive results amounting to local necrosis. Two further Mantoux tests were done with negative results, but at the end of 2½ months a third Mantoux was positive. Within 48 hours of this final tuberculin test a new wine-coloured infiltration appeared round the scab of the receding Mitsuda reaction, and then disappeared again in 2 or 3 days. The authors suggest that in certain circumstances there may be cross allergy allowing tuberculin "to call forth an early Mitsuda re-activation already in its final regressive period". *Ernest Muir*

Convit, J., Rassi, E., Canto Rodriguez, F. & Contreras, R. **Changes in the Lepromin and Tuberculin Reactions of Lepromin-Negative Leprosy Patients after Vaccination with BCG.** *Internat. J. Leprosy.* New Orleans. 1952, July–Sept., v. 20, No. 3, 347–54. [17 refs.]

The relationship between tuberculosis and leprosy is first discussed, and the possibility that the former disease might affect the clinical course of leprosy is considered. The authors' experiment consisted in vaccinating intradermally with 0·2 cc. of BCG suspension 113 patients who had recovered under treatment from lepromatous leprosy, but who gave negtative lepromin reactions. Of these, 51 were tuberculin-negative, and out of them 13 became lepromin-positive. Of the remaining 62, who were plus-1 tuberculin-positive, the lepromin test became positive in 33. Thus the Mitsuda test became positive in 40·7 per cent. of the whole 113 cases.

In 40 patients with the indeterminate form of leprosy, who had both lepromin and tuberculin tests negative, 87·5 per cent. became lepromin-positive. In 2 cases of the indeterminate form, in which the diffusion of lesions as well as the strongly positive bacteriological findings and negative lepromin made it likely that a transformation to the lepromatous form was taking place, after revaccination with BCG the lepromin test became positive and the clinical and bacteriological pictures were completely modified. *Ernest Muir*

Sagher, F., Kocsard, E. & Liban, E. **Specific Tissue Alterations in Leprous Skin. I. Transformation of the Tuberculin Reaction in Leprous Patients into Leproma-Like Lesions.** *Internat. J. Leprosy.* New Orleans. 1952, July–Sept., v. 20, No. 3, 341–6, 6 figs. on pl. [10 refs.]

Two patients, who had recovered from leprosy as far as clinical signs were concerned, one of whom had a slightly positive and the other a negative lepromin reaction, were injected intradermally with tuberculin, and each of them developed at the site of inoculation a nodule indistinguishable clinically and histologically from true leproma. In both of them, on second tuberculin inoculations being done, similar nodules developed. The nodules persisted for about a year and then gradually disappeared. *Ernest Muir*

HAMAZAKI, Y. Ueber das spezifische Lepra Pigment der Lymphdrüse. (Ein Beitrag zur Karyopathologie.) [**Specific Pigment in the Lymphatic Glands in Leprosy. A Contribution to Nuclear Pathology**] *Acta Path. Japonica.* 1951, Jan., v. 1, No. 1, 1–6, 1 fig.

The author has undertaken a study of the nuclear changes in the lymphatic glands in 32 cases of leprosy, 27 of the lepromatous form, 3 of the maculo-anaesthetic and 2 of the nervous form. For this investigation the ordinary methods used in pathological histology did not prove very satisfactory. The best procedure, in the author's view, is fixation in a chromium or mercury mixture followed by treatment with baryta water for staining of lipoids and lipo-fuchsin, called by him the KFJ method (carbol fuchsin iodine, *Karbol-fuchsinjod*). He considers various theories as to the origin of the lipofuchsin ; in his view it is due to adsorption of the lipoids on the split products of the nucleic acid, as small brown vesicular bodies or collections in which chaulmoogra oil plays no part, but only the broken down lepra bacteria which result from administration of the oil [this seems to be a very narrow distinction]. The description is somewhat involved but is summed up in the author's words [translated] : " By the defence reaction of the living organisms the aggregated bacilli assume in the nuclei a vesicular form (*Bläschenform*), just as bacilli in the lepra cells by massing and fusing together form vacuoles, whereby the split products of the deoxyribonucleic acid unite with the lipoids of the bacilli and thus the lipofuchsin is formed." *H. Harold Scott*

MARCO AHUIR, R., TORRELLA GIL, E. & ALCARAZ GARCIA, M. La reacción de hemaglutinación de Middlebroock-Dubos en la lepra. [**The Haemagglutination Reaction of Middlebrook-Dubos in Leprosy**] *Rev. " Fontilles ".* Valencia. 1952, July, v. 3, No. 2, 105–15.

The results are given of 114 leprosy cases tested for this reaction, which is used in tuberculosis. It was found positive at high titres in untreated cases of leprosy or in those suffering from lepra reaction, and with low titres in patients recovering under treatment. It was negative in patients whose condition was particularly good, and invariably so in tuberculoid cases. It is considered that the positive results are partly due to a specific immunological reaction with the bacterial group of Mycobacteria, and partly to reactionary destruction of the tissues. *Ernest Muir*

FLOCH, H. & SOHIER, R. Sur l'intérêt de la réaction d'hémagglutination à divers antigènes tuberculeux dans la maladie de Hansen. [**On the Importance of the Haemagglutination Reaction with various Tubercle Antigens in Leprosy**] *Arch. Inst. Pasteur de la Guyane et du Territoire de l'Inini. Publication No. 272.* 1952, Sept., 4 pp.

The authors applied the method of Middlebrook-Dubos in different types of leprosy, using 4 different types of antigen. Of these they found that the most marked reactions were with a tuberculin called " I.P.48 " [Institut Pasteur], which gave 33 per cent. of positives in 54 patients. The reaction was found positive very seldom in cases of the undifferentiated and tuberculoid forms of leprosy (19 and 27 per cent. respectively) but more frequently in the lepromatous form (65 per cent.). The authors consider that the reaction has prognostic value, negativity and negativation being favourable. They believe that in comparing the bacillus of Koch with that of Hansen, extracts of each bacillus should be used in place of comparing tuberculin with Mitsuda's bacillary suspension. *Ernest Muir*

GATTI, J. C. & CARDAMA, J. E. Sobre la clasificación de las formas clínicas de la lepra y estados de reacción. Nuestra opinión respondiendo a una encuesta de H. W. Wade. [**On the Classification of the Clinical Forms of Leprosy and States of Reaction ; our Opinion in Response to the Request of H. W. Wade**] *Rev. Argentina Dermatosifilologia.* 1952, Oct.–Dec., v. 36, No. 4, 229–35, 1 diagram. [10 refs.] English summary.

This paper is written in reply to a request by Dr. Wade that leprologists should define their ideas on leprosy classification with a view to formulating a universally acceptable formula at the forthcoming International Congress on Leprosy in Madrid in October 1953. The authors hold to the triple primary classification into Lepromatous, Undifferentiated and Tuberculoid.

Reactional states are divided according to the type of the disease. Tuberculoid reacting conditions are divided into Leprotic Tuberculoid Reaction and Reactional Tuberculoid, the latter term being reserved for patients with varying ranges of immunity, but highly allergic ; and this form may mark the point when an Undifferentiated case turns into a Tuberculoid. The Intermediate or Marginal form is included under the Reactional Tuberculoid, or the Undifferentiated in a state of reaction. An attempt to make this very complicated classification clearer is made by means of a diagram. *Ernest Muir*

WADE, H. W. **The Leonard Wood Memorial Working Clinical Conference held in Japan, September 15–27, 1952. Report of Committee on Terms and Definitions.** [News & Notes.] *Internat. J. Leprosy.* New Orleans. 1952, July–Sept., v. 20, No. 3, 385–92.

Three units have been set up by the Leonard Wood Memorial, specially equipped for clinical evaluation of certain drugs and combinations of drugs in the treatment of leprosy, working with the co-operation of the respective governments in South Africa, The Philippines and Japan. The purposes of the conference were—" apart from promoting personal acquaintances among those from different regions who were concerned with the studies and understanding of each other's points of view—to ascertain how well those engaged in the work agreed in their procedures, especially with respect to the examining of cases and recording of their lesions ; to attempt to approach more closely to uniformity in terminology with respect to the lesions and reactional phenomena seen in lepromatous cases (not involving the general problem of classification) ; to consider the experiences and results so far in relation to the rest of the present experiment ; and, in the light of that experience, to consider plans for the next series of experiments ". The benefits of workers from different countries getting together are illustrated by a case of leprosy, regarding which there was a difference of opinion as to whether it was lepromatous or tuberculoid, but which was finally agreed to be a lepromatous case after a biopsy had been examined at Culion. The conclusion was that " it appears that in Japan there are lepromatous cases, recognized as such there, which are deceptive to workers in other countries ". *Ernest Muir*

MONTEL, M. L. R. Lèpres nerveuses pures dermatologiquement asymptomatiques. Lèpres minimales. Précession des lésions nerveuses sur les symptômes cutanés. [**Pure Nerve Leprosy without Skin Manifestations. Nerve Lesions Preceding Cutaneous Lesions**] *Bull. Soc. Path. Exot.* 1952, v. 45, No. 6, 749–57, 4 figs. on 2 pls.

The author illustrates by means of 8 cases his thesis that pure nerve leprosy sometimes precedes leprosy of the skin, and indeed that in some cases a considerable period of years may pass during which the only lesion is one of the

nerves. It is therefore very important that in all suspected cases of leprosy a careful examination should be made for thickened nerves. When the skin is at last affected the form of leprosy is generally found to be tuberculoid. These cases generally yield satisfactorily to sulphone treatment. *Ernest Muir*

Møller-Christensen, V., Bakke, S. N., Melsom, R. S. & Waaler, E. **Changes in the Anterior Nasal Spine and the Alveolar Process of the Maxillary Bone in Leprosy.** *Internat. J. Leprosy.* New Orleans. 1952, July–Sept., v. 20, No. 3, 335–40, 5 figs. on 2 pls.

In 7 cases of leprosy, 5 of them maculo-anaesthetic and 2 mixed, the anterior nasal spine was found absent. As there were no sensory changes which would account for this the authors consider that it could not have been due to neurotrophic disturbance of the bone. The possibility is discussed whether this may not be an early symptom of leprosy, and, as it is easy to palpate, an additional aid to early diagnosis. *Ernest Muir*

Contreras, F., Guillen, J., Torrella, E. & Alcaraz, M. Tratamiento de la reaccion leprotica (lepro-reacción lepromatosa) con plasma. [**The Treatment of Lepromatous Lepra Reaction with Plasma**] *Internat. J. Leprosy.* New Orleans. 1952, July–Sept., v. 20, No. 3, 317–33, 7 graphs. [14 refs.] English summary.

The authors distinguish between the "typical" form of lepra reaction and "other acute outbreaks or reactions that may occur during the course of the disease". In the former they have found the transfusion of "isoplasma" (plasma from calf blood deprived of its anaphylactic properties) effective. They have used this method in 22 patients, giving in all 85 transfusions. Twelve patients tolerated this treatment perfectly, 6 showed slight unfavourable reactions, and in 4 there were serious, though short-lived, allergic effects. All the patients showed some improvement, especially those with gastric symptoms, epistaxis and neuritis. The theory of action is that in lepromatous cases there is an excess of globulin in the serum, and that during severe reaction there is considerable diapedesis of plasma, resulting in hypoproteinaemia; this is compensated by the transfusions. *Ernest Muir*

Floch, H. & Sureau, P. Action du 1500 F en injections locales dans les névrites lépreuses. [**Action of 1500 F Locally Injected in Leprosy Neuritis**] *Arch. Inst. Pasteur de la Guyane et du Territoire de l'Inini. Publication No. 273.* 1952, Oct., 6 pp.

Injections once or twice a week of 2 to 3 cc. of this monosubstituted sulphone [succinyl DDS], in a 25 per cent. solution, round thickened and tender nerves, was found in 8 cases to diminish the thickness and tenderness of the nerve, and also to loosen and make more mobile the fingers supplied by the affected nerve. *Ernest Muir*

Floch, H., Lecuiller, A. & Sureau, P. Sur le traitement sulfoné de la lèpre. Devenir de la diaminodiphénylsulfoneacétylsulfonamide (disulfone) administrée *per os* dans l'organisme. [**On the Sulphone Treatment of Leprosy. The Fate of Diaminodiphenylsulphone-Acetyl-Sulphonamide (Disulphone) when Administered by Mouth**] *Bull. Soc. Path. Exot.* 1952, v. 45, No. 6, 712–17. [12 refs.]

This compound (Promacetin) is compared with DDS. It is found to be stable both inside and outside the body, and is excreted unchanged in the urine. Its

toxicity is low in comparison with that of DDS, but this is at least partly due to the fact that, while DDS given orally is almost entirely absorbed, Promacetin is excreted to a large extent in the stools. Promacetin is said to have an action *in vitro* only $\frac{1}{20}$ of that of DDS. In a dose of 3 gm. by mouth it gives a blood concentration of about 2·5 mgm. per cent. If the activity *in vivo* is comparable to the activity *in vitro*, then 2·5 mgm. per cent. of Promacetin corresponds to 0·12 mgm. per cent. of DDS ; but with 200 mgm. of DDS by mouth there is a blood concentration of about 0·60 mgm. per cent. The authors therefore prefer DDS in the treatment of leprosy. *Ernest Muir*

Francis, J. **The Distribution of Sulphone in the Tissues of Various Animals.** *J. Comp. Path. & Therap.* 1953, Jan., v. 63, No. 1, 1–6.

Earlier work had indicated differences in the distribution of DDS between animals of different species and ages. It seemed possible that this fact might explain the variation in toxicity encountered. Mice, pigs, dogs, cows, and sheep were treated with the sulphone by various routes and its concentration in different tissues was determined by extracting them with 5 per cent. trichloracetic acid and estimating according to the method described by Rose and Bevan (*Biochem. J.*, 1944, v. 38, 116). It was found that differences in toxicity of the drug were not always explained by the distribution. Its relatively low concentration in tissues, including the brain of the bovine, however, probably does explain the absence of toxicity in that animal. In other animals in which a high concentration of sulphone occurred in the brain nervous symptoms were manifest. Thus young mice for this reason suffer more from nervous symptoms than old mice. Methaemoglobinaemia is less common in the bovine than in the other animals, although the concentration of sulphone found in the blood was higher than in the liver, which is the reverse of that found in other species.
J. D. Fulton

Berti, F. A., Zitti, L. M., Perego, C., Rzeppa, H. W., Rieckmann, B. H. G. & Rapp, O. P. **Chemotherapy of Leprosy. II. Compounds structurally related to 4,4′-Diaminodiphenylsulfone. Chemical Studies.** *Rev. Brasileira Leprologia.* S. Paulo. 1952, June, v. 20, No. 2, 104–15, 2 graphs. [21 refs.]

The authors, following the methods of Mauri, Hadler and Carvalho [this *Bulletin*, 1952, v. 49, 412], prepared and tested in rats 4 compounds which differ from DDS only in the sulphonic group. They describe the methods of preparation, the chemical formulae and other details, and show in curves the blood-levels as compared to those of DDS after oral administration to rats. One of these, 4,4′-diaminodiphenylcetone, was tested in rats and found to be very toxic. *Ernest Muir*

Hadler, W. A., Carvalho, C. M. & Mauri, A. C. Quimioterapia da lepra. III. Ação de compostos estruturalmente relacionados ao 4,4′-diaminodifenil sulfona na lepra murina (sulfóxido, sulfeto, benzofenona e amina). [**Chemotherapy of Leprosy. III. Action of Compounds structurally related to the 4,4′-Diaminodiphenyl Sulphone on the Development of Murine Leprosy (Sulphoxide, Sulphide, Benzophenone and Amine)**] *Rev. Brasileira Leprologia.* S. Paulo. 1952, June, v. 20, No. 2, 116–31, 4 figs. [14 refs.] English summary.

This article is a continuation of that above. The 4 compounds referred to were tested in rats infected with rat leprosy, by the method previously referred to. In the conditions of the experiment, treatment with the new compounds

did not show any difference in the survival time as compared with the controls. On the other hand there was a marked increase of the survival time in the rats treated with DDS. *Ernest Muir*

HANKS, J. H. & BACKERMAN, T. **Comparison of Susceptible and Resistant Rats for measuring the Infectiousness of *M. leprae murium* after *in Vitro* Experimentation.** *Internat. J. Leprosy.* New Orleans. 1952, July–Sept., v. 20, No. 3, 361–3.

Comparisons were made between more susceptible and less susceptible rats, and the former were used to detect the various degrees of infectiousness of suspensions of rat leprosy bacilli which had been subjected to treatment by refrigeration. *Ernest Muir*

HELMINTHIASIS

MAY, J. M. **Map of the World Distribution of Helminthiases.** Reprinted from *Geographical Rev.* 1952, v. 42, No. 1, 98–101, 1 coloured folding pl. (maps).

This useful set of maps of the distribution of the most important helminthic infections of man contains a wealth of information on its 6 square feet (3′×2′) of surface. It comprises 3 large-scale and 11 small-scale maps, and in these the species of helminths are grouped according to the mode of transmission to man, namely by ingestion, skin penetration or insect bite. The small-scale maps show the distribution of certain individual species, a wise dispersal since it avoids overcrowding. The arrangement and colour of the symbols for the various species are effective and pleasing to the eye. One of the small-scale maps shows the world distribution of sheep and is appropriately in juxtaposition with the maps of *Fasciola hepatica* and hydatid distribution. There is also a résumé of the epidemiology in tabular form, which gives the essential steps in the life-cycle of each species and the physical and cultural factors involved in their transmission. On the reverse side of the map sheet there is a comprehensive bibliography showing the basic sources consulted in the compilation of the maps, and, headed by the name of each country, the principal references to published papers on distribution.

J. J. C. Buckley

EL ZAHAWI, S. Bilharziose appendiculaire et appendicite bilharzienne. [**Schistosomiasis Lesions of the Appendix and Schistosomal Appendicitis**] *Bull. et Mém. Soc. Méd. Hôpit. de Paris.* 1952, Nos. 30/31, 1155–9, 5 figs.

Schistosomiasis due to *S. haematobium* is widespread in Iraq ; some 80 per cent. of the population of the southern part of the country suffer from it. The usual manifestations are urinary, but additionally there may be intestinal symptoms. Parasitic lesions of the vermiform appendix are more commonly due to schistosomiasis than to threadworm infection. Acute schistosomal appendicitis is always associated with an eosinophilia. Of 317 vermiform appendices removed surgically, or post mortem, at the Royal Hospital, Baghdad, 13 were found to contain eggs of *Schistosoma haematobium* ; 2 were without gross pathology ; 2 which also were infected showed subacute lesions ; and the remaining 9 were markedly fibrotic. The macroscopic and histological appearances of the various types of appendicular lesions due to this parasitization are described, and illustrated in 5 figures. *A. R. D. Adams*

Mohammed, A. S. **Bilharziasis of the Seminal Vesicles.** *J. Roy. Egyptian Med. Ass.* 1952, v. 35, Nos. 9/10, 613–26, 9 figs. on 6 pls.

The author has already described a proliferative schistosomal lesion of the seminal vesicles [this *Bulletin*, 1931, v. 28, 669]. Since then other workers have recorded various changes due to schistosomiasis which they have encountered in the seminal vesicles ; their observations and conclusions are reviewed here. At post-mortem examinations done in a pathology department in Cairo a search has regularly been made for schistosomal lesions in various organs. At post-mortem examinations adequately conducted and recorded 183 (57·55 per cent.) of 318 patients were found to have schistosomal lesions of various organs, and 163 (nearly 90 per cent.) of these had lesions in the urinary bladder ; 32 of them were females. Of 137 males on whom there was a proper report on the prostate and seminal vesicles 26 (19 per cent.) had schistosomal lesions in the prostate, and 109 (80 per cent.) lesions in the seminal vesicles. The seminal vesicles, therefore, usually were found to be involved when schistosomal lesions were evident in the bladder, but prostatic involvement was rare. Moreover in 5 cases in which lesions were found in the seminal vesicles none was noted in the urinary bladder. It was thought that in this series of cases the lesions found in the seminal vesicles were more pronounced and of longer standing than were those seen in the bladder.

The author recapitulates the route of migration of the adult worms from the liver down the portal vein to the haemorrhoidal plexus, which encircles the rectum and communicates freely with the vesico-prostatic plexus through the middle and inferior haemorrhoidal veins. Veins draining the wall of the bladder, the seminal vesicles and the vasa deferentia enter the prostatic plexus. The worms can therefore ascend the veins from the seminal vesicles as readily as those from the bladder wall. The bladder wall distends and forcibly contracts many times each day ; so its vessels are periodically compressed and worms may be dislodged from them. But the seminal vesicles are more or less inert, so worms in vessels in them are much less prone to expulsion. As it is usual at autopsy to examine the bladder carefully infection of this organ is unlikely to escape notice ; but the seminal vesicles are usually not examined or at most only superficially, so lesions in them probably are often missed. The author thinks that seminal vesicle involvement is not secondary to bladder involvement as has hitherto been taught, but is independent of it and even more common than it.

The changes in the seminal vesicles resultant on schistosomal infection are those seen elsewhere, namely, congestion, tissue proliferation and fibrosis. They continue to recur so long as fresh batches of eggs lodge in the tissues. The final result is a tumour composed of fibrotic and partially calcified vesicles which are matted together and to the surrounding areolar tissue. On section, ova are found in all three layers of the walls of the vesicles ; ulceration of the mucosa is responsible for haemospermia ; fibrosis of the neck of the vesicles causes them to dilate, and the semen escapes from the vasa deferentia to the urethra, so causing spermatorrhoea. When the vasa deferentia are obstructed there is infertility. The lodgement of ova in sympathetic ganglia and nerves supplying the seminal vesicles may result in sexual hyper-excitability ; while destruction of the sympathetic nerves leads to diminished sexual capacity. Over-distension and irritation of the seminal vesicles similarly causes sexual hyper-sensibility ; but, later, exhaustion of the centres may result in impotence. Neither the prostate nor the urethra is the primary source of these phenomena ; it is the diseased seminal vesicles which are their origin. Details of the autopsy findings in 3 cases illustrate the changes occurring in seminal vesicles which are the seat of schistosomal lesions. The paper is illustrated by 2 photographs and 7 photomicrographs. *A. R. D. Adams*

HALAWANI, A., ABDALLAH, A., DAWOOD, M. & SAIF, M. **Further Experience in the Treatment of Bilharzia with Miracil-D, Nilodin, and Lucanthone Salicylate. Amelioration of the Side-Effects of Miracil by Belladonna and Neo-Antergan.** *J. Roy. Egyptian Med. Ass.* 1952, v. 35, Nos. 11/12, 735–48.

The senior authors have already reported that sugar-coated tablets of Miracil D hydrochloride (Nilodin) containing 22 mgm./kgm. of the patient's body weight, given daily for 12 days, cure 80 per cent. of cases of *haematobium* schistosomiasis in Egypt [this *Bulletin*, 1950, v. 47, 1204]. Though the parasitic cure-rate was so satisfactory the side-effects of the treatment were often severe. Further studies have been made with a view to obviating the latter while maintaining the high cure-rate ; these are briefly outlined in the present paper.

It is concluded that uncoated tablets of Miracil D hydrochloride are more effective than are the coated tablets, but that the side-effects with these are greater. Lucanthone salicylate (Nilodin salicylate), when given in doses of 27 mgm./kgm. of body weight daily for 8 days, is also effective ; but again the side-effects are severe, and in susceptible persons hallucinations occur. Miracil D base, given in doses of 22 mgm./kgm. of body weight daily for 5 or 6 days, is also effective, but it causes severe side-effects. If Miracil D hydrochloride is given with Extractum belladonnae siccum (containing 10 mgm. of the active alkaloids) the toxicity of the drug is minimized ; if the antispasmodic, Neo-antergan, is used instead of Extr. belladonnae siccum the side-effects are less effectively controlled. The drugs should be given either in one or two doses daily ; a tablet is swallowed every 5 minutes immediately after food until the full dose is taken ; nausea and an inclination to vomit can be lessened by giving more food. If cardiac or hepatic distress becomes evident 20 ml. of 25 per cent. glucose should be given intravenously. *A. R. D. Adams*

SEITZ, E. **Evaluation of various Methods of Treatment of Urinary Schistosomiasis in a Coastal Area of Tanganyika.** *J. Trop. Med. & Hyg.* 1953, Jan., v. 56, No. 1, 2–4. [10 refs.]

The author reports on 1,353 African labourers, drawn from Central and East Africa, and from the Belgian Congo, who were admitted to a hospital during 1951 in Tanganyika Territory. As a routine their urine was examined and 262 were found to be passing red cells and 207 others schistosome eggs. Re-examination of the urines, taken after strenuous exercise, of 130 of the 262 patients apparently passing only blood showed 96 of them also to pass eggs ; and after a single injection of 0·08 gm. of sodium antimonyl tartrate had been given to the other 132 of the 262, eggs appeared in the urines of 108 of them. Thus 411 (30·4 per cent.) of the 1,353 patients examined were proved to suffer from urinary schistosomiasis. An examination of 100 similar persons, selected at random outside the hospital, yielded 23 cases of the disease. The incidence of urinary schistosomiasis in this labour force was therefore high.

The treatment given consisted of long courses of sodium antimonyl tartrate (10–16 intravenous injections during 3 weeks) and short courses of this drug (as advocated by ALVES and BLAIR), or else oral Nilodin either in sugar-coated or in plain tablets for 3 days, 5 days, or 7 to 10 days. Sugar-coated Nilodin tablets were found to pass through the intestine unabsorbed, and were abandoned. The data available after careful re-examination of the patients for at least 6 weeks after completion of the various forms of treatment showed the vastly superior results following sodium antimonyl tartrate treatment over

those obtained with oral Nilodin. The intensive antimony course extending over a two-day period proved as therapeutically effective as the longer antimony course, and because the short course was completed before patients wearied of treatment, and could abandon it, in practice it was superior to the longer course.

A. R. D. Adams

FAIN, A. Description de la cercaire de *Schistosoma intercalatum* Fischer 1934 et d'une nouvelle xiphidiocercaire du groupe Ornatae (sous-groupe Prima). [**Description of the Cercaria of** *Schistosoma intercalatum* **and of a New Xiphidiocercaria of the Group Ornatae**] *Ann. Soc. Belge de Méd. Trop.* 1952, Oct. 31, v. 32, No. 5, 433–43, 2 figs. [11 refs.]

The author describes the cercariae of *Schistosoma intercalatum* which were emitted by *Physopsis africana* collected from a small tributary of the Congo River at Stanleyville. Their identity was established by experimental infection of mice which passed eggs from 44 to 53 days after exposure. Measurements are given of both faecal and uterine eggs. The description of the cercariae includes measurements of both living and heat-killed specimens. They are said to be distinguishable from cercariae of *S. mansoni* principally by the presence, on each side of the body, of 5 penetration glands instead of 6 in the latter (*S. mansoni*). [This statement is open to criticism since GORDON and GRIFFITHS (this *Bulletin*, 1952, v. 49, 1055) have demonstrated that the 6th pair of glands in *S. mansoni* cercariae are " escape glands ", and are only visible in cercariae which have been dissected out of the snail's liver.] The other differences between the two species of cercariae are said to be less important and sometimes difficult to demonstrate. [It is of interest to note that the body of the cercaria of *S. intercalatum* is described as having 4 to 5 medium-sized hairs on each side. VERCAMMEN-GRANDJEAN (*ibid.*, 777), in his admirable description of these body hairs in the cercariae of *S. mansoni*, states their number to be 12 on each side.]

In addition to *S. intercalatum* cercariae, some of the *Physopsis africana* were emitting cercariae belonging to the group Xiphidiocercariae. These are described as a new species *C. meyersi*, of the sub-family Pneumonoecesinae whose representatives are parasitic in the lungs of amphibians.

J. J. C. Buckley

SCHWETZ, J. Sur un nouveau foyer de *Schistosoma rodhaini* avec un nouveau transmetteur. [**A New Focus of** *Schistosoma rodhaini* **and a New Snail Host**] *Ann. Soc. Belge de Méd. Trop.* 1952, Oct. 31, v. 32, No. 5, 473–7, 1 map.

On exposing mice at Albertville to cercariae from *Planorbis pfeifferi* and *P. tanganikanus* it was found that the cercariae from the latter species were those of *Schistosoma rodhaini*. Eggs appeared in the faeces of the mice between the 30th and 40th days after exposure. Albertville is thus shown to be a new locality for this schistosome and *P. tanganikanus* a new snail host. This parasite has hitherto been recorded only from Elizabethville, 800 kilometres from Albertville, and *P. pfeifferi* is its transmitter there. Preliminary examination of wild rodents at Albertville has established the occurrence of *S. rodhaini* in *Dasymys*, *Pelomys* and *Mastomys*. *J. J. C. Buckley*

KAGAN, I. G. & LEE, Chang-ling. **Chemotherapy of Experimental Infections of Mice with** *Schistosomatium douthitti*, *Schistosoma mansoni* **and** *Schistosoma japonicum*. *J. Infect. Dis.* 1952, Nov.–Dec., v. 91, No. 3, 224–30. [17 refs.]

The authors have tested 3 antimonial compounds—2-hydroxy-4-methylol-4, 5-dihydro-1,3,2,dithiastibiole, butyl antimonyl gallate, tri-(*n*-dodecylmercapto)-s-antimonious acid—and also Miracil D, one of a group of xanthones, against infections in mice with *Schistosomatium douthitti*, *Schistosoma mansoni*, and *Schistosoma japonicum*. The third named substance was administered intraperitoneally in peanut oil, and the others were given orally. Mice were infected with *S. douthitti*, an indigenous species in U.S.A., and with *S. japonicum* by placing cercariae on the clipped abdominal wall. Infections with *S. mansoni* were obtained by exposure of the mouse tail to cercariae in water. The 3 antimonial compounds were given daily for 12 days at doses slightly above those described by SCHUBERT *et al.* [this *Bulletin*, 1948, v. 45, 621 ; 1949, v. 46, 646 ; 1951, v. 48, 380]. The method of dosage used for Miracil D as described by KIKUTH and GÖNNERT [*ibid.*, 1949, v. 46, 481] was followed.

The mice were autopsied about 2 weeks after the final dose of drug. Abdominal viscera were examined carefully for worms, pigment and eggs. The effectiveness of a drug was gauged by comparing the number of worms present after treatment with that in controls. Many points of resemblance between *S. douthitti* and *S. japonicum* are given and the authors believe that the former is a very useful test object for screening drugs of potential value against *S. japonicum*. It is indigenous in U.S.A., is easily maintained, does not produce systemic infections in man, and reacts like *S. japonicum* to drugs. It was found that the antimony compounds tested were effective against all 3 infections, the oil-soluble substance being most active. Miracil D was active against *S. mansoni* but not against *S. douthitti*. *J. D. Fulton*

PASQUALINO, A. Sulla cisticercosi umana. [**A Case of Human Cysticercosis**] *Arch. Ital. Sci. Med. Trop. e Parassit.* 1952, Nov., v. 33, No. 11, 591–604, 3 figs. [13 refs.]

The English summary appended to the paper is as follows :—

"A case of subcutaneous cysticercosis (*T. solium*) in a girl is described. A granulomatosis-like aspect with giant cells characterized the pericystic reaction. Pathogenic observations are made on the localization of the cysticercus and on the histological aspect of the pericystic reaction."

BRUMPT, L. C. Déductions cliniques tirées de cinquante cas d'ankylostomose provoquée. [**Clinical Deductions drawn from 50 Cases of Induced Ancylostomiasis**] *Ann. Parasit. Humaine et Comparée.* 1952, v. 27, Nos. 1, 2 & 3, 237–49, 1 chart.

In hot countries the clinical study of ancylostomiasis is complicated by the presence of other infections and dietary deficiencies. A study of the effect of pure ancylostomiasis was undertaken by inducing infections artificially in 53 patients, of whom 46 were suffering from polycythaemia and 7 from hypertension.

Larvae of *A. duodenale* were deposited on the skin of the thigh under damp blotting paper which was left until it was dry, usually for an hour.

The cutaneous lesions (miners' itch) that were procured varied according to the subject's previous experience. At the first application there was at first

no visible reaction, but on the next day or the day after there was an erythema produced by a carpet of fine red papules velvety to the touch, which partly disappeared on pressure ; there was a moderate pruritus which occurred at night. These lesions had completely disappeared in 10 days.

In cases in which there had been a previous application, a red urticarial patch appeared immediately but disappeared in a few hours and was replaced by red papules 1 to 2 millimetres in diameter with intervals of healthy skin. On only one occasion did a primary application lead to the development of urticaria. At the third and fourth applications the local reaction became more severe and included local oedema involving a wide area and vesicle formation.

Although the patients were in a Paris Hospital and under constant clinical and radiological supervision no signs or symptoms suggestive of Loeffler's syndrome were seen. Many of them, however, had upper respiratory symptoms from about the fourth day after infection, a capricious dry cough, a hoarse voice and sometimes complete aphonia, and a sore throat, usually worse at night and associated with insomnia, for 2 or 3 days. These symptoms persisted for about 3 weeks.

About the 5th day dysphagia was common and from about the 8th day to the 30th day there was sometimes pain, vomiting and diarrhoea, and a general deterioration of the patient's condition. X-ray confirmed the existence of duodenitis. At this stage there was usually some fall of blood pressure in hypertensives and a degree of anaemia ; the former is probably an indirect effect, due to the diarrhoea. The duodenitis seldom lasted more than 2 weeks but the diarrhoea often continued for 3 or 4 weeks or even longer. The fall in the red cell count, however, was more chronic.

Egg counts were not done regularly so that it was not possible to correlate the blood counts with the hookworm load. Further, the majority of the patients had polycythaemia, with red cell counts from 6 to 10 millions per cmm. The count usually began to fall at the end of the first month and reached the 4 million mark by the fourth month : during the next 2 or 3 months the effects of blood regeneration became apparent and the counts became stabilized at about 5 millions, that is, below the original count to which they tended to return in 2 to 4 years. However, reinfection was sometimes indicated at a much earlier date and one patient received 2,200 ancylostomes in 8 years (the average initial dose was 425 larvae).

In other cases, usually females, a severe hypochromic anaemia resulted but required intensive iron treatment, and in some of these the number of red cells returned rapidly to its previous high level, despite the low haemoglobin percentage. In others the reduction in red cells was not effected until a certain threshold level of infection was established by superinfecting ; it then became marked.

There was a hypoplastic tendency and the average reticulocyte count was 2 per cent. A sternal puncture in two cases showed only 12 and 14 per cent. erythroblasts.

The eosinophile curve increased rapidly reaching a peak of 50 to 75 per cent. by the end of the third month ; it then fell almost as rapidly to about 15 per cent. by the end of the year and eventually reached 5 per cent. by the third or fourth year.

The curve was not affected materially by the extent of the worm load or by reinfection ; in one patient who was passing 3,500 eggs per gramme the count was only 3·5 per cent.

The total white cell count followed the same course, reaching its peak—25,000 to 60,000—about the fourth month ; the leucocytosis tended to persist longer : this to some extent masked the eosinophilia in the later stages if one

considered only percentages. The neutrophiles were both absolutely and relatively increased.

In two patients infected by 300 and 700 larvae, the eggs appeared in the stools on the 41st and 38th days, respectively. The number of eggs per gramme of stool was usually about 11 times the number of infecting larvae. The persistence of the worms varied ; in one patient eggs were very scanty at the end of 2 years whereas in another there were 3,500 per gramme after 45 months. In 2 other cases examined 4½ and 5½ years after infection, the stools were negative. The numbers of eggs found after reinfection or superinfection did not suggest any immunity.

The author discusses the various theories regarding the cause of the anaemia of ancylostomiasis and favours that which envisages a direct toxic action on the haemopoietic system. *L. E. Napier*

ANDERS, W. Über die Verwurmung Berliner Schulkinder. [**On the Incidence of Worms (*Ascaris* and *Trichuris*) in Berlin Schoolchildren**] *Öffentl. Gesundheitsdienst.* Stuttgart. 1952, Dec., v. 14, No. 9, 360–63.

The author studied, between the autumn of 1950 and the spring of 1952, the incidence of *Ascaris* and *Trichuris* in schoolchildren in north Berlin. A total of 13,331 children were examined. The degree of infection was not related to the age or sex of the children, but to the sanitation systems of the areas in which the children lived. Thus *Ascaris* was found in 2·9 per cent. of children living in areas with a water sanitation system (*viz.*, Reinickendorf East and West, Tegel and Borsigwalde) ; in 6·7 per cent. of those living in rural areas without a water sanitation system (*viz.*, Lübars, Heiligensee, Tegelort and Konradshöhe) and in 14·3 per cent. of children living in the suburb of Frohnau. The higher incidence in Frohnau was surprising. The explanation of it lay in the changed post-war conditions. The houses, most of which are without a water sanitation system, have cesspits. When the population of Frohnau doubled, the cesspits filled twice as fast and their contents overflowed or were pumped on to the gardens. Removal of faeces costs money and the people wished to grow their own vegetables and manured their gardens with faeces, so that the children infected themselves while playing in the gardens or by eating vegetables or salads grown in them. In rural areas without a water sanitation system, on the other hand, there was a lower incidence of the worms, because for years the faeces have been disposed of in compost or by manuring only at the right times. Thus control of *Ascaris* is a public health matter and in agricultural areas it is related to the manuring and choice of vegetables. Only in a slight degree is it a problem for therapeutic treatment by doctors.

Clinical examination of the children showed that out of 368 children infected with *Ascaris*, 8 per cent. showed distinct symptoms, and 34 per cent. had slight symptoms. Out of 132 children infected with *Trichuris*, 17·5 per cent. showed distinct symptoms, and 30 per cent. had slight symptoms. In all the areas studied the incidence of *Trichuris* was 3 per cent. ; but, because the eggs of this species are relatively uncommon, all the children infected were probably not detected. Of a series of 337 children infected with *Ascaris* 103 (30·6 per cent.) had an eosinophilia over 6 per cent. Of another group of 122 children infected with *Trichuris* 35 (28·7 per cent.) had an eosinophilia above 6 per cent. Eosinophilia can therefore not be used as a certain diagnostic sign of worm infection. About 1,000 children infected with *Ascaris* and *Trichuris* were treated with ascaridol. This was successful for the treatment of 80 per cent. of the children infected with *Ascaris*, but had practically no effect upon *Trichuris*. Similar work is in progress in west Berlin and among the canal workers, and work on enterobiasis is planned. *G. Lapage*

HORTA, J. da S. & DELFIM, J. Ascaridiose. Migração de numerosos vermes adultos pela veia porta. Focos de necrose do fígado de morfologia particular. (Revisão dos quadros de ascaridiose ; referência especial aos quadros hepáticos.) [**Migration of Numerous Adult *Ascaris* by the Portal Vein. Focal Necrosis in the Liver Showing Definitive Morphological Changes**] *Gaz. Méd. Portuguesa.* 1952, v. 5, No. 4, 581–603, 13 figs. [12 (1 coloured) on 4 pls.] [66 refs.] English summary.

i. COLBOURNE, M. J. **Treatment of Ascariasis with Hetrazan in the Gold Coast.** *Trans. Roy. Soc. Trop. Med. & Hyg.* 1952, Nov., v. 46, No. 6, 662–5.

ii. THOMSON, F. A. **Treatment of Ascariasis with Diethylcarbamazine.** [Correspondence.] *Ibid.*, 679.

i. The author briefly mentions his own earlier work [this *Bulletin*, 1950, v. 47, 768] and the work of ETTELDORF and CRAWFORD [*ibid.*, 1951, v. 48, 486] and LOUGHLIN *et al.* [*ibid.*, 1952, v. 49, 424] on the treatment of human ascariasis with hetrazan. This paper records the results obtained by the author when he treated 40 African patients in the Gold Coast, all of whom were also suffering from leprosy, with doses larger than those he himself used previously. The patients were divided into 2 groups paired with regard to sex, weight and number of stool-films containing *Ascaris* eggs. The stools were retested before treatment. One group was treated with hetrazan, the other with oil of chenopodium. The doses were : Chenopodium—15 minims followed an hour later by 15 minims, with a purge 2 hours later. JELLIFFE [*ibid.*, 1951, v. 48, 1026] has pointed out the dangers of excessive doses of oil of chenopodium. Hetrazan—14 mgm. per kgm. body weight once daily for 4 days in the form of a syrup containing 30 mgm. per 1 ml. The patients used individual bucket latrines and the number of worms passed daily during the week of the test was recorded. The stools were then examined twice, one week and one month respectively after treatment.

The author concluded that hetrazan is as efficient as oil of chenopodium for the treatment of ascariasis, but that its disadvantages are : (i) treatment with it must be given on 4 successive days ; and (2) 5 of the patients treated with hetrazan complained of skin irritation and in 2 patients the pruritus was severe. Examination of the skin showed the presence of infective larvae of *Dipetalonema streptocerca* in 3 of these 5 patients. Skin irritation occurred in 2 cases in which *D. streptocerca* was not found. On the other hand, 2 patients who had *D. streptocerca* had no skin irritation after treatment with hetrazan. The author discusses the possible relationship between treatment with hetrazan and infection with *D. streptocerca* and refers to the work of WANSON *et al.* [this *Bulletin*, 1950, v. 47, 873] who reported slight urticaria during treatment of streptocerciasis with hetrazan, and that of BURCH [*ibid.*, 1952, v. 49, 170], who suggested that the occurrence of pruritus after treatment with hetrazan is a point in the diagnosis of onchocerciasis. The author could not confirm Wanson's finding that hetrazan removed the microfilariae of *D. streptocerca* from the skin.

ii. The author treated 50 cases of ascariasis in children, whose ages are not stated, with diethylcarbamizine, using hetrazan (Lederle) and banocide (Burroughs Wellcome). He found that the effective dose was 20 mgm. per 24 hours, given for not less than 4 days and states that " a course of 7 days would appear to be adequate ". Mothers were told to crush the tablets in a little warm water. Large numbers of worms, non-motile, but alive, were expelled. There were no toxic symptoms. [See also HOEKENGA, this *Bulletin*, 1952, v. 49, 1139.]

G. Lapage

Fros, J. & Winckel, W. E. F. **The Development of *Microfilaria bancrofti* Inside and Outside the Macrofilaria.** *Documenta Med. Geograph. et Trop.* Amsterdam. 1952, Dec., v. 4, No. 4, 365–9, 7 figs.

The material for this paper was obtained from an epitrochlear lymph gland from which, after immersion in physiological saline, a macrofilaria emerged. The cuticle being torn a large number of eggs dispersed into the surrounding fluid. After a lapse of 15 minutes the embryos in some eggs had coiled themselves into the shape of " pretzels " (Dutch biscuits), while others had stretched themselves into microfilariae.

Dimensions of the eggs were $41 \times 55\mu$, larger than those of eggs *in utero*. The pretzel-shaped embryos measured $43 \times 61\mu$, but one had developed from an oval egg to a microfilaria, complete with sheath, 216μ in length. At the same time a microfilaria from the blood of the same patient measured 322μ and there was a distinct difference in the staining capacity of the nuclei.

Sections of the macrofilaria at the anterior end showed microfilariae lying parallel with each other and with the longitudinal axis of the uterus. It is clear that *W. bancrofti* is not oviparious in the sense that round or oval eggs are born *per vias naturales*.

The appearances are shown in 7 photomicrographs.

Philip Manson-Bahr

Reid, J. A. **Transmission of Filariasis.** [Correspondence.] *Trans. Roy. Soc. Trop. Med. & Hyg.* 1953, Jan., v. 47, No. 1, 84.

The author, from Malaya, records observations made there in 1949, which there has not been an opportunity to follow up so far.

It was observed that when *Anopheles* were fed on a patient with some 350 microfilariae of *W. bancrofti* per 60 cmm. of blood, nearly every mosquito discharged at least one drop of blood from the tip of the abdomen during feeding : on the other hand, *Mansonioides*, the chief natural vector of *W. malayi*, when it fed voided only clear serum-like fluid. Stained preparations showed that drops of blood from 4 specimens of *Anopheles barbirostris* contained 1 to 18 unaltered microfilariae per drop, while the clear drops from *Mansonioides annulifera* contained nothing.

Other things being equal, a species of mosquito behaving like *A. barbirostris* would not carry as many worms as one that behaved like *M. annulifera* ; this behaviour might clearly have a bearing on transmission, if it could be shown to be constant.

This remarkable, and apparently unrecorded, behaviour of *Mansonioides* might provide an explanation of the concentrating of microfilariae believed to occur in some vectors : the belief is based on the finding in an insect of more worms than could be expected from the density in the patient's blood and the size of the blood meal : the latter is commonly estimated by weighing the insects before and after feeding and evidently the ejection of large drops of clear fluid would result in a considerable underestimate of the quantity of blood ingested. The usual explanation given for the concentrating effect is that the saliva of the insect injected into the bite attracts the microfilariae.

Owing to the incompleteness of the investigations the author is unable to state conclusively whether concentration does in fact occur with *Mansonioides*. [This phenomenon might well be of considerable practical importance and merits fuller investigation.] *H. J. O'D. Burke-Gaffney*

WINCKEL, W. E. F. & FROS, J. **Acute Lymphadenitis caused by** *Wuchereria bancrofti*. *Documenta Med. Geograph. et Trop.* Amsterdam. 1952, Dec., v. 4, No. 4, 361–5, 3 figs.

The filaria investigation in Paramaribo during the last three years, which has included more than 50,000 persons, has shown :—

(*a*) Most attacks of filarial lymphadenitis started with a tender inflamed swelling of the lymphatic glands, and there was descending lymphangitis.

(*b*) The attack commenced without apparent external cause, but trauma predisposed to bring about descending without preceding ascending lymphangitis.

(*c*) Microfilariae were demonstrated in the blood, without clinical symptoms of filariasis, in about 63 per cent. of those infected.

(*d*) In only 25 per cent. of sufferers from these attacks could microfilariae be found in the peripheral blood.

(*e*) Several subjects with microfilaraemia—who had never previously suffered from attacks—developed lymphangitis during hetrazan treatment.

(*f*) The frequency and violence of attacks have often decreased with hetrazan.

(*g*) An abscess after an acute attack was seldom observed.

These conclusions received support from the microscopical examination of biopsy material, consisting of lymphatic glands from two patients.

In one a cavity was revealed showing many transverse sections of an adult filaria containing developing microfilariae. The wall consisted of proliferative inflammation with formation of many foreign body giant cells. Scattered granulation tissue contained the remnants of microfilariae, sometimes in a giant cell. The capsule of the gland was thickened and neutrophiles and eosinophiles were found outside it. The second specimen consisted of two glands. The microscopic structure of one of these resembled the above, while the other was characterized by pseudo-tubercles, epithelioid and giant cells. Cavities covered with fibroblasts and fibrocytes in palisade position were scattered at random, and various calcified remains of adult filariae were found.

It is concluded that live adult filariae do not cause acute lymphadenitis, but that the death of the parasite brings about the reaction ; but large numbers of microfilariae may cause tissue necrosis with acute inflammatory symptoms.

Philip Manson-Bahr

LEHMANN DE ALMEIDA, C. G. Ensaio terapêutico com o Hetrazan em casos de infestação por "*Acanthocheilonema perstans*". [**Treatment with Hetrazan of Cases of Infestation with** *Dipetalonema perstans*] *Anais Inst. Med. Trop.* Lisbon. 1952, Mar., v. 9, No. 1, 127–44. [18 refs.] English summary.

Ten Africans in Portuguese Guinea whose blood showed microfilariae of *Dipetalonema perstans* only, were given doses of 10–15 mgm./kgm. of hetrazan daily by mouth. They were removed from the endemic region, medically examined, and were divided for treatment into 3 groups : the 4 patients of the first group received daily doses of 10 mgm./kgm., 2 of them for 15 days, the other 2 for 8 days ; the second group of 4 were given a daily dose of 12 mgm./kgm., 2 of them for 10 days, 2 for 15 days. Of the third group of 2 patients, one received daily doses of 12 mgm./kgm. for 16 days and the other took 15 mgm./kgm. for 10 days. The results of microscopical examination of the blood before, during, and soon after treatment, as well as at 1, 6 and 9 months later, are shown in tables. Microfilariae disappeared from the blood in 7 of the 10 patients but 3 had a relapse which, however, yielded to a second course of treatment ; the other 3 cases were resistant. No signs of intolerance of the drug were observed. [See this *Bulletin*, 1951, v. 48, 1028 ; 1950, v. 47, 873.]

J. F. Corson

KERSHAW, W. E. & WILLIAMSON, J. **Studies on the Chemoprophylaxis of Experimental Filariasis with MSb (Friedheim). I.—The Prophylactic Activity during an Interval of Six Months.** *Ann. Trop. Med. & Parasit.* 1952, Nov., v. 46, No. 3, 268–75, 1 diagram.

The compound MSb is a complex polymer of sodium *p*-melaminylphenylstibonate, molecular weight 5,000–10,000. Previous work by the authors has shown that it protected cotton rats against infection by *Litomosoides* [this *Bulletin*, 1949, v. 46, 488]. The present work deals with (*a*) the minimal dose which would protect for 6 months and (*b*) the relation of antimony retention to prophylactic activity.

For the former purpose cotton rats were given a single intraperitoneal injection of the drug in aqueous solution, and 28–30 weeks later they were exposed to mites infected with *Litomosoides*. In the first series of experiments the results were rather irregular. Doses ranging from 15 to 250 mgm. per kgm. protected the rats, but no dose protected every rat in the group of 3–5 rats treated.

In a second series of experiments the drug was given suspended in oil and injected subcutaneously, and the rats were exposed to infection at 11 to 25 weeks. Again the results were somewhat irregular. Briefly, 125 mgm./kgm. protected all six rats, 35 mgm./kgm. gave partial protection while 15 mgm. and 7·5 mgm. protected only a third of the rats. In some of the rats (classified as "Partially protected") the worms developed but were stunted and abnormal.

F. Hawking

WILLIAMSON, J. & KERSHAW, W. E. **Studies on the Chemoprophylaxis of Experimental Filariasis with MSb (Friedheim). II.—The Retention and Distribution of the Drug.** *Ann. Trop. Med. & Parasit.* 1952, Dec., v. 46, No. 4, 320–30, 3 figs. [12 refs.]

In this second paper a description is given of estimations of the antimony present in the rats described above, and in similar rats. Briefly, the lungs and the peritoneal contents of rats (treated by intraperitoneal injection) contained antimony in amounts which were greater with larger doses than with smaller ones. The amount of antimony diminished gradually with time, and after 16 weeks only small amounts could be detected. After 6 months, 5 per cent. of the original dose was still present in the tissues. This long persistence is due to the precipitation of the compound in an insoluble form (as free acid). No antimony was detected in the spleen or heart ; and blood serum showed no definite trypanocidal action *in vitro*. The liver and kidney absorbed proportionally more antimony than the gastro-intestinal tract or the fat and connective tissue of the peritoneal cavity. Probably there is a low persistent concentration of antimony in the circulating blood.

F. Hawking

STONES, P. B. **Successful Treatment of Loiasis with Diethylcarbamazine in Low Dosage.** *West African Med. J.* 1952, Oct.–Nov.–Dec., v. 1 (n.s.), No. 4, 174–80. [18 refs.]

The author, from Nigeria, records the successful treatment of 20 out of 21 Europeans (17 males and 4 females) suffering from loiasis with doses of hetrazan much lower than those used by earlier workers. Details of these cases are given. Only 3 patients were treated in hospital. The dosage was : 19 patients received from 1 to 2 mgm. of hetrazan per kgm. body weight 3 times a day for 7 days, and 2 patients received 4 mgm. per kgm. body weight 3 times a day for 7 days. The total amounts of hetrazan received were : 3·15 gm. by 4 patients ; 2·1 gm. by 14 patients ; 1·05 gm. by 1 patient ; 6·3 gm. by 2 patients.

The treatment caused reactions in only 7 patients and the author thinks that these reactions were due to effects of the drug on the worms rather than to its effects directly on the patients. In 2 cases worms appeared under the skin 3 hours and 24 hours respectively after the first dose and performed vigorous movements, accompanied in 1 patient by severe, generalized pruritus ; but these movements subsided in 2 to 12 hours and did not recur. The author suggests that these 2 patients show the lethal action of hetrazan on the worm [see BONNIN and MORETTI, this *Bulletin*, 1950, v. 47, 1115]. The author records, for what he believes to be the first time, asthmatic attacks as a feature of loiasis.

All the patients, except one, were free from symptoms 7 days after treatment with the doses stated above. The cases were followed up for periods of 6 months to 2 years and all the 20 patients remained free from symptoms. The remaining patient, who had had 6·3 gm. of hetrazan, had a recurrence of symptoms 1 month after treatment. The author compares his total doses of 22 to 90 mgm. (average 39 mgm.) per kgm. with the doses of 100 to 200 mgm. per kgm. body weight given by earlier workers, whose papers are quoted, for the treatment of loiasis and Bancroftian filariasis. *G. Lapage*

See also p. 448, TOULANT & BOITHIAS, Les lésions du fond d'oeil dans l'onchocercose africaine. [**Lesions of the Fundus of the Eye in Onchocerciasis in Africa**]

MARTINEZ BAEZ, M. Acción del Hetrazán sobre *Onchocerca volvulus* al estado adulto. [**Action of Hetrazan on Adult** *Onchocerca volvulus*] *Medicina*. Mexico. 1952, Nov. 25, v. 32, No. 664, 521–3.

Hetrazan is acknowledged to act on the embryos of *O. volvulus* and this drug has been combined, therefore, with excision of nodules containing the adult filariae because without excision it was found that after an interval embryos again appeared. But—and this is important—a study of 300 nodules extirpated from patients who had *not* been given the hetrazan showed structural changes in greater or less degree in the adult worm, changes which had previously been ascribed to the action of the drug. Such changes were found in 56 per cent. Comparing these with examination of 121 nodules from patients who had received the hetrazan previously, 91 (75·2 per cent.) showed the same changes. From this, the inference is drawn that hetrazan affects not only the embryos but also the adult *O. volvulus*. *H. Harold Scott*

See also p. 432, ANDERS, Über die Verwurmung Berliner Schulkinder. [**On the Incidence of Worms** (*Ascaris* **and** *Trichuris*) **in Berlin Schoolchildren**]

MAZZOTTI, L. Conservación de huevos de *Enterobius vermicularis* en las preparaciones hechas por el método de Graham. [**Preservation of** *Enterobius* **Eggs in Preparations Made by Graham's Method**] *Rev. Inst. Salubridad y Enfermedades Trop.* Mexico. 1951, Jan.–Dec., v. 12, Nos. 1/4, 27–8, 1 fig. English summary.

The author found that in preparations made by Graham's cellulose tape method eggs of *Enterobius vermicularis* were preserved for 8 years. The appearance is shown in a photomicrograph. While the egg shells are thickened and the contained larvae largely destroyed, the contour is sufficiently retained to make identification readily possible.

The advantages of this preservation are that the examiner can study the preparations at his leisure, slides may be sent to distant laboratories from the field in the course of survey work and retrospective studies may be made for comparative and other purposes. *H. J. O'D. Burke-Gaffney*

ZAFFINO, C. & RASPA, G. L'ossiurosi negli individui adulti. [**Enterobiasis in Adults**] *Riv. di Parassit.* Rome. 1952, Oct., v. 13, No. 4, 307–8.

The English summary appended to the paper is as follows :—

"The authors have examined, through Graham's technique, 300 adult patients of Pianosa Sanatorium. 46 of them (15·33%) were found positive for *E. vermicularis* at single examination. The results show the low frequency of such a parasitosis in adults, compared to the high frequency usually present in children. No true correlation between infestation and symptoms was ascertained."

DEFICIENCY DISEASES

CAMAIN, R. & PIERCHON, M. Lésions pancréatiques dans le syndrome de dénutrition maligne. [**Pancreatic Lesions in the Syndrome of Malignant Malnutrition**] *Rev. Coloniale de Méd. et Chir.* 1952, Dec. 15, v. 24, No. 208, 220–22.

In 34 autopsies on victims of kwashiorkor in French West Africa, pancreatic lesions were always found. In all but 6 cases there was fatty degeneration of the liver and in all there was atrophy of the external secreting cells of the pancreas : less constantly there was hypertrophy of the islets of Langerhans and hyperplasia of intercellular connective tissue. *R. Passmore*

BABLET, J. & CANET, J., with the technical assistance of O. KVIATKOVSKY. Étude histopathologique des troubles de la nutrition chez le nourrisson et l'enfant vietnamien. [**Histopathological Studies of Nutritional Disorders in Vietnam Infants and Children**] *Ann. Inst. Pasteur.* 1952, Nov., v. 83, No. 5, 595–607, 10 figs. (2 on 2 pls.) [20 refs.]

Nutritional disorders in infants and young children resembling kwashiorkor, as described in Africa, are reported from Indo-China. Fatty degeneration of the liver and pancreatic necrosis was constantly found and the pancreatic lesion appeared in many cases to have preceded the liver lesion. Further, the suprarenal glands were enlarged and generally fragile. The cortex had an excess of fats ; both congestion and sclerosis were present in the medulla. These alterations in the suprarenals found in cases of malnutrition resembled those found in toxic fevers. These histopathological changes were demonstrated in very young and even in premature infants and reflect deficiencies in maternal nutrition. The paper is illustrated by 10 photomicrographs, showing lesions in the liver, pancreas, kidney and suprarenal glands. *R. Passmore*

HAEMATOLOGY

BIANCO, I., MONTALENTI, G., SILVESTRONI, E. & SINISCALCO, M. **Further Data on Genetics of Microcythaemia or Thalassaemia Minor and Cooley's Disease or Thalassaemia Major.** *Ann. Eugenics.* 1952, May, v. 16, Pt. 4, 299–315, 1 fig. [34 refs.]

This hereditary disease, in its major and minor forms, is almost confined to some of the Mediterranean races. It is believed that one dose of the gene produces the minor form, while two give the full Cooley's anaemia. The results of

the present study are in agreement with this hypothesis. Cooley's disease is invariably fatal before reproductive age is reached. In the minor form, while the serological findings are constant, the clinical picture varies widely, ranging from complete normality to relatively severe anaemia ; some persons have an icteric colour.

The authors present data for a number of centres throughout Italy. The lowest percentage of persons suffering from the minor form is just under 1, and the highest 10. This astonishing frequency is found in the Ferrara area, and corresponds to a gene frequency of no less than 5 per cent. Other areas where the frequency is high are Sicily, Sardinia and the eastern part of Southern Italy. The very high frequency in such areas as Ferrara poses a problem. One in every 400 children must die of Cooley's anaemia and each time this occurs two of the genes are lost to the population. How then can the high frequency be maintained ? The authors consider 4 hypotheses. The first, that those with one dose of the gene might have higher fitness is negatived by this and other studies. The second, replacement by mutation, is rendered highly improbable by the enormous mutation rate that would be required, as well as by other considerations. The third, that there might be selective mating, the authors succeed in disproving. They are left with the fourth, for which they give strong evidence. This is that couples who lose a child may tend not only to replace it but to over-replace it. Couples who both carry the gene have lost on the average 2·16 live-born children, whereas in other matings the average loss is 0·09. But the carrier couples have an average of 5·42 live-born children per family against only 3·21 for other couples, and so end up with an average of 0·14 *more* living children. This striking observation is in agreement with important recent work, which shows that it may be unsafe on occasion to make calculations on the assumption that in these personal matters human beings behave like automatons.

J. A. Fraser Roberts

Sarrouy, C., Cabannès, R., Sendra, L. & Zevaco, P. Thalassémie et syndromes neuro-hémolytiques. [**Thalassaemia and "Neuro-haemolytic Syndromes"**] *Bull. et Mém. Soc. Méd. Hôpit. de Paris.* 1952, Nos. 22/23, 825–30.

Details are given of Algerian Moslem twins, aged 15 months, in whom there were features of Cooley's anaemia. In addition, both were mentally retarded and their muscular tone was deficient. One child had nystagmus with oculogyrocrises, the head was in a constant state of irregular movement, and he continually made sucking noises with the mouth and tongue. Apart from this, examination of the central nervous system revealed no abnormalities. The authors draw attention to a frequent occurrence of neurological defects in patients suffering from Cooley's anaemia.

A. W. Woodruff

VENOMS AND ANTIVENENES

Bragdon, D. E. & McManus, J. F. A. **Histochemical Distribution of 5-Nucleotidase in Snake Tissues : Presence of 5-Nucleotidase and Absence of Alkaline Phosphomonoesterase in Venom Glands of the Rattlesnake.** *Quart. J. Microscop. Sci.* 1952, Dec., v. 93, Pt. 4, 391–4, 1 fig. on pl. [12 refs.]

"1. Activity of the specific alkaline phosphatase, 5-nucleotidase, is intense in the epithelium and secretion of the rattlesnake venom gland. Non-specific alkaline phosphatase activity is lacking.

"2. Thyroid epithelium, the smooth muscle of great vessels, and (inconstantly) smooth muscle of abdominal hollow viscera show greater 5-nucleotidase than non-specific activity.

"3. These findings confirm the specificity of 5-nucleotidase."

HADIDIAN, Z. **The Action of Venom and Proteolytic Enzymes on the Non-Specific Inhibitor of Hyaluronidase.** *J. General Physiol.* 1953, Jan. 20, v. 36, No. 3, 361–9. [19 refs.]

"1. It has been shown that a number of proteolytic enzymes and snake venom, in relatively small amounts, and within a wide range of pH variation, will restore hyaluronidase activity after its inhibition by serum.

"2. The known properties of the venom protease are found to be identical with those of Haas' 'proinvasin I.' It is concluded that the protease of the venom offers adequate explanation for the effects previously attributed to 'proinvasin I.'

"3. Proteolytic activity is found in hyaluronidase preparations of bovine origin and is considered to be responsible for the reversal of inhibition of hyaluronidase by serum."

SILVA JUNIOR, M. Revisão dos métodos antivenenoterápicos. [**Review of Anti-venene Treatment (of Snake-bite)**] *Brasil-Médico.* 1952, Oct. 18 & 25, v. 66, Nos. 42/43, 661–71. [Refs. in footnotes.]

CHRISTENSEN, P. A. & FINNEY, D. J. **Standardization of Cobra (*Naja flava*) Venom using the Graded Response Method.** *J. Immunology.* 1953, Jan., v. 70, No. 1, 7–20, 1 fig.

LE MARE, D. W. **Poisonous Malayan Fish.** *Med. J. Malaya.* 1952, Sept., v. 7, No. 1, 1–8, 2 figs.

Seeing that in 7 pages the author gives accounts not only of several genera and species of Malayan fish, but also of sea-snakes and marine worms, and refers to king-crabs, sea-urchins, razor shell and live coral, it will be obvious that the descriptions must, perforce, be very sketchy.

The author is Director of Fisheries and deals with the subject from the morphological and piscatorial aspects rather than the medical. He introduces his subject by stating the well-known types of categories of fish-poisoning : fish whose flesh normally, when eaten, gives rise to toxic symptoms ; others to acquired bacterial infections, others, again, to poisonous spines or toxin injected by way of wounds from spines, and so on. He goes on to tell of cat-fish, *Plotosus anguillaris*, *P. canias* and *Paraplotosus albilabris* ; of sting-rays, the whip-tailed sting-ray (*Trygon* sp.), the eagle rays (*Myliobatis*) and the cow-nosed rays (*Rhinoptera*), describing the situation of the poison spines ; the Scorpion fish (*Scorpaenidae*) of which the most important is *Synanceia verrucosa*, and next *Synanceia horrida* and *Apistus cottoides*, the last a small Scorpaenid common in Singapore waters. The Globe fish are next described, the species mainly responsible for poisoning being the silvery puffer *Spheroides lunaris*, and the poison tetradonin.

Eleven genera and more than 20 species of sea-snakes occur in the Malayan waters, the commonest being *Enhydrina schistosa* ; their venom is highly toxic, so it is fortunate that they rarely bite unless provoked or caught in the net of fishermen. Many of the Malayan jelly fish are harmless, but some species of

Charybdieidae may cause serious symptoms. Finally, marine worms, *Amphinomidae*, poison by their stinging hairs. The author gives the Malay names for most of the species he mentioned in his address. *H. Harold Scott*

DERMATOLOGY AND FUNGUS DISEASES

NEGRONI, P., BRIZ DE NEGRONI, C., DAGLIO, C. A., VIVANCOS, C. & BONATTI, A. Estudios sobre el *Coccidioides immitis* Rixford et Gilchrist. XII. Cuarta contribución al estudio de la endemia Argentina. [**Studies on *Coccidioides immitis* Rixford & Gilchrist. XII. Fourth Contribution to the Study of the Endemic Areas of Argentina**] *Rev. Argentina Dermatosifilologia*. 1952, Oct.–Dec., v. 36, No. 4, 269–75, 2 figs. English summary.

The discovery of 2 cases of coccidioidomycosis, one in Las Termas (Province of Santiago del Estero) and the other in Tucumán (Department of Leales), prompted the authors to undertake a survey by means of the coccidioidin test on children aged from 6 to 16 and of both sexes attending various schools in an arid region extending from the south of Tucumán to the east-central part of the province of Santiago del Estero, in northern Argentina. Brief descriptions are given of the topography of the country and the meteorological conditions existing at different seasons.

For the skin tests, coccidioidin (lot No. 48) was used at a dilution of 1 : 100, and recordings were made of the reactions, which were classified as doubtful and four degrees of positive results, the highest showing central necrosis. The tests were made on 2,413 children attending 15 different schools, and 230 gave positive results (9·5 per cent.). Significantly high reactor rates were recorded in 2 schools ; in Las Termas, school No. 39 had 101 reactors in 512 children tested (19·72 per cent.), and in Santiago del Estero, school No. 88 had 83 reactors in 470 children (17·65 per cent.). In both of these schools instances of marked and severe reactions to the test were numerous. In other schools reactors were absent or the reactor rate was relatively low, except in a school at Los Bulacio (Tucumán), with 4 reactors in 64 children (6·25 per cent.) and another school in La Banda, Moreno, which had 14 reactors in 202 children (6·93 per cent.).

From the results of the coccidioidin tests it appears that an area of endemic coccidioidomycosis exists in the province of Santiago del Estero, extending from Las Termas to the western part of the City of Santiago del Estero, where the reactor rate was 17·65 per cent. In a school at the opposite side of this city, the reactor rate was only 3·79 per cent. There is a natural line of division, following the course of the river Salado from N.W. to S.E., separating the wooded plain to the N.E. from the treeless Chaco to the S.W. which embraces the endemic area.

Samples of soil taken from parts of the suspected endemic area will be examined for the presence of pathogenic fungi and the results reported in a future communication.

Tests with paracoccidioidin (*Paracoccidioides brasiliensis*) used at 1 : 10, were made simultaneously with the coccidioidin tests, and in 5 schools reactor rates ranging from 2·47 to 4·68 per cent. were recorded. The possible significance of these results has not yet been determined.

A report on the geographical distribution of endemic coccidiodomycosis in Argentina was made by NIÑO and FERRADA URZÚA [below, 1953, p. 442].

J. T. Duncan

Niño, F. L. & Ferrada Urzúa, L. Contribución al estudio de la endemia de coccidioidomicosis en la República Argentina. [**Study of the Endemic Distribution of Coccidioidomycosis in the Argentine Republic**] *Prensa Méd. Argentina.* 1950, Dec. 1, v. 37, No. 48, 2920–28, 2 maps. [41 refs.]

After Posadas, in 1892, published the first record of the disease, no other case of coccidioidomycosis was reported in Argentina for 35 years. Then Mazza and Parodi, in 1927, diagnosed it in a man from the Argentine Chaco. Up to 1950, a total of only 12 cases had been proved in Argentina, and it is noteworthy that in at least 5 of these the causative fungus (*Coccidioides immitis*) was not cultivated and the diagnosis was based solely on the result of the histological examination. The geographical areas in which these 12 cases occurred were San Luis, Chaco (2), Santiago del Estero (2), Buenos Aires, Córdoba, Río Negro (2), Tucumán (2) and Catamarca.

The coccidioidin test was applied to 833 adults from various parts of the country and a total of only 24 reactors (2·88 per cent.) was recorded. In Buenos Aires 6 reactors were found in 420 people examined (1·42 per cent.) in Córdoba 4 in 161 (2·48 per cent.) and in Tucumán 2 in 119 (1·67 per cent.). In 18 other areas the numbers of people examined were too small to be of statistical value.

The results of the coccidioidin test and the geographical distribution of the 12 cases of coccidioidomycosis indicate the existence of 3 different endemic areas of the disease in Argentina : in the north the Argentine Chaco ; in the centre the provinces of Tucumán, Catamarca, Córdoba, Santiago del Estero, and San Luis, and in the south the province of Río Negro.

The coccidioidin test gave a negative result with cases of paracoccidioidal granuloma, actinomycosis, mycotic intertrigo, mycotic onychia, blastomycotic vulvo-vaginitis and monilial meningitis. It also gave a negative result in a number of non-fungal diseases, but markedly positive reactions in two cases of " articular rheumatism " and one of Chagas's disease in the endemic zone. The findings are shown in 4 tables and 2 maps. *J. T. Duncan*

Maloney, P. J. **Addison's Disease due to Chronic Disseminated Coccidioidomycosis.** *Arch. Intern. Med.* 1952, Dec., v. 90, No. 6, 869–78, 7 figs.

The adrenals may be affected in about one-third of all cases of disseminated coccidioidomycosis—Forbus and Besterbreurtje [this *Bulletin*, 1948, v. 45, 269] found these organs affected in 32 per cent. of their series of 50 cases studied post mortem—nevertheless, symptoms of Addison's disease have very rarely been recorded. It is possible that symptoms specially referable to disease of the adrenals may sometimes be obscured in the general symptomatology of coccidioidomycosis, but, on the other hand, the absence of such symptoms may be attributable to the limited extent of the destruction of adrenal tissue : Barker (*Arch. Pathology*, 1929, v. 8, 432) considered that clinically typical Addison's disease implied destruction of more than 95 per cent. of the adrenal tissue.

In the present paper, accounts are given of two fatal cases of coccidioidomycosis in which clinical signs of Addison's disease were present. In the first of these cases, which was included in a series of autopsy findings reported by Butt and Hoffman [this *Bulletin*, 1946, v. 43, 63], the clinical signs of Addison's disease were, low blood pressure (60/40), " gastric upsets " and brownish pigmentation of the skin which was most marked on the face, neck and nipple areas. At autopsy, both adrenals were found to be enlarged and the normal adrenal parenchyma was replaced by a fibro-granulomatous tissue

with many areas of caseous necrosis, but still showing the sporangial bodies of *Coccidioides immitis*. No intact adrenal cortex was found.

The second case was marked by extreme weakness, anorexia, intractable nausea and vomiting with loss of weight. The systolic blood pressure was equal to only 60 mm. mercury and the diastolic pressure was not measurable. These signs, in conjunction with a brownish mottling of the skin, pointed to adrenal disease and this was confirmed at autopsy at which the adrenal tissue was found to have been completely destroyed and replaced by nectrotizing granulomata and fibrous tissue. In this case, despite the history of proved coccidioidomycosis of ten years' duration, *C. immitis* could not be identified with certainty in the tissues at post mortem. The cause of death was coronary sclerosis.

The appearance of the adrenals is shown in 4 photographs and 3 photomicrographs. *J. T. Duncan*

DEFRENNE, P. Troisième cas de chromoblastomycose au Congo Belge. [**The Third Case of Chromoblastomycosis in the Belgian Congo**] *Ann. Soc. Belge de Méd. Trop.* 1952, Oct. 31, v. 32, No. 5, 417–19, 1 fig. on pl.

The first two cases of chromoblastomycosis identified in the Belgian Congo were discovered in 1951 [this *Bulletin*, 1952, v. 49, 185, 306]. They occurred in a low-lying hot and humid region which is regarded as the home of superficial fungus infections. The third case, the subject of the present report, was discovered in 1952 on the high plateau of Katanga, a wooded plain enjoying a subtropical climate. The patient, a man aged 35, had apparently contracted the infection when working on railway construction in a thickly wooded sector, and the earliest observed manifestation of the disease was a small, oval nodule in the skin a little below and behind the external malleolus of the left ankle, with a verrucose surface which tended to bleed from slight trauma. During the next 3 years the lesion extended slowly upwards, following the course of the lymphatics, and formed a " T "-shaped plaque composed of 5 fused nodules. The verrucose surface presented fissures from which a greenish-yellow, blood-stained fluid could be expressed. An isolated secondary lesion, oval in outline, about 10·0 cm. in length and of fungating appearance, developed on the lateral aspect of the leg at the lower end of its middle one-third.

Sections of the morbid tissue, obtained by biopsy, presented the characteristic histological picture of chromoblastomycosis, with the thickened epidermis showing hyperkeratosis and marked acanthosis in which great epidermal downgrowths penetrated deeply into the dermis. Little granulomatous foci consisting of histiocytes, plasma cells, fibroblasts and multinucleate giant cells, in which the fungal elements are seen, were scattered throughout the dermis. There were also aggregations of polymorphonuclear cells with many eosinophiles forming micro-abscesses. These leucocytic aggregations were also seen in some of the granulomata, and lesser infiltrations, sometimes with fungal cells, in the deeper part of the epidermis. The fungal cells, which were seen within the giant cells or in the micro-abscesses, were round or oval in outline, about 10 to 20μ in diameter, reddish-brown, thick-walled and sometimes septate, reproducing by fission and usually occurring in groups of 2 to 5.

The fungus, isolated in culture on glucose agar, was identified as *Phialophora pedrosoi*.

The large size of the lesion rendered treatment by radical excision and skin grafting impracticable, and electro-coagulation was employed, followed by local antiseptic treatment and administration of potassium iodide orally. The result was apparently satisfactory. *J. T. Duncan*

THYS, A., COURTOIS, G. & VANBREUSEGHEM, R., with the collaboration of D. H. BAKER, M. BERTRAND, A. DE MUYNCKE, P. LIMBOS & R. VERSELDER. A propos de 9 nouveaux cas congolais de chromoblastomycose. Essai et échec du traitement par la pentamidine. [**Concerning 9 New Cases of Chromoblastomycosis in the Congo. Unsuccessful Attempt at Treatment by Pentamidine**] *Ann. Soc. Belge de Méd. Trop.* 1952, Oct. 31, v. 32, No. 5, 491–500, 6 figs. on 2 pls.

Previous to 1951, no case of chromoblastomycosis had been proved mycologically in the Belgian Congo, or indeed in Central Africa. In that year the first authentic report of the disease in the Belgian Congo was made by Vanbreuseghem *et al.* [this *Bulletin*, 1951, v. 49, 185] and the second four months later by RASSON and THYS [*ibid.*, 306]. During the next year, 10 other cases were brought to light, including 2 from an examination of old histopathological sections stored at the Medical Laboratory, Stanleyville. This is a remarkable record in view of the fact that probably less than 200 cases had been reported from all parts of the world, and in Cuba, with the highest known incidence of the disease, only 30 cases have been reported up to the present time.

An analysis of the 12 Congo cases yielded the following data The geographical distribution of the cases was in Bengamisa, Yumbi, Jadotville, Opala (3), Butemo, Mondonbe, Gombari, Stanleyville, Albertville and Bokungu. Of 11 patients, 10 were males and 1 female, and the age usually about the middle period of life. The lesions were almost invariably situated on the lower extremity and the duration of the disease was as long as 10 years in two cases and 20 years in another. The initial clinical diagnosis included yaws, tropical ulcer, benign tumour, vegetating tumour of the skin, verrucose tuberculosis and psoriasis. In all cases the mycological diagnosis was established by microscopy and in 6 cases also by culture.

Brief accounts are given of the 12 cases and a more detailed description of the histopathology of the disease (see DEFRENNE above, 1953, p. 443).

A study of 4 strains of the fungus isolated from this series of cases showed it to be *Phialophora pedrosoi*, a species found also in North and South Africa. The cultures presented both the Hormodendrum and Acrotheca types of conidial apparatus but no phialides. Owing to its extreme fragility, the examination of the conidial apparatus in micro-culture was difficult, and the method of growing the fungus on isolated hairs, devised by Vanbreuseghem, was found more suitable for this study.

In treatment, electro-coagulation followed by skin grafting was preferable to surgical excision, and after-treatment with applications of 5 per cent. gentian violet was helpful. In 2 cases which were unsuitable for surgical treatment, injections of propamidine intravenously, as a 5 per cent. solution with glucose, were given daily to a total dosage of 2·35 gm. The course was repeated three times but without any observed benefit. *J. T. Duncan*

POWELL, R. E. **A Survey of Chromoblastomycosis in Queensland.** *Australian J. Dermat.* 1952, Oct., v. 1, No. 4, 214–22, 4 text figs. & 7 figs. on 2 pls.

This is an attempt to assess the incidence and distribution of chromoblastomycosis in Queensland from a study of pathological material and from clinical case records. Thirty-five proved cases were investigated, from 19 of which the causative fungus had been isolated and identified, and from 29 clinical and epidemiological data were collected.

The geographical distribution of the disease covered an area extending from Texas, on the south-eastern boundary of the state, to Cairns in the north, and from the coastal range to the east coast. The disease was found most

frequently in the greater Brisbane region in the south-east, probably because of the closer investigation conducted there, but its existence in the Cape York Peninsular, north of Cairns, is probable.

The sex of the patients is not recorded, but from the occupational records it would appear that they were all males. Their ages ranged from 19 to 77 years, the highest incidence of the disease being in the age-group 60 to 70 years and then the group 30 to 40 years. According to occupation, farmers, stockmen, agricultural labourers and timber cutters were the predominant group, and the few remaining occupations also entailed manual work out of doors. There was a significant connexion between the disease and work in a wooded country or directly with timber, and in many cases there was a history of trauma preceding the development of the specific lesion. Contact with farm animals, chiefly horses and cattle, was common but probably not significant. In 26 out of 29 cases the lesion was situated on an exposed part of the upper limb, chiefly about the hand and wrist ; in the remaining 3 it occurred on the knee, ankle and ear respectively. The relatively low rate of infection of the lower limbs, in contrast to the high rate in America and Africa, is attributable to the protective foot-wear and leg-wear worn. The area of the lesion increased with its age and in one case it measured 16 by 14 cm., frequently it was about 4 to 5 cm. by 3 to 4 cm. and the smallest was 1·5 cm. in diameter. It occurred chiefly on the dorsal aspect of the limb or, if on the ventral aspect, tended to extend towards the dorsal surface.

In treatment, radium used in a gamma ray mould giving approximately 4,000 r. over a 7-day period, or, alternatively, X-ray treatment to about one-half the dosage used for skin cancer, was found effective.

The fungi isolated from the Queensland cases belonged to two types : *Fonsecaea pedrosoi* var. *cladosporium* Simson, and *F. pedrosoi* var. *cladosporoides* Carrión. The latter type was uncommon and was found in only two areas, Brisbane and Maleny on the coast, but the former type occurred in 17 other areas. Mycological descriptions are given of these fungi, by which it is shown that *F. pedrosoi* var. *cladosporoides* presents the three types of conidial apparatus characteristic of the genus, of which the *Hormodendrum* type predominates. *F. pedrosoi* var. *cladosporium* shows only the purely *Hormodendrum* type of fructification, and the author contends that it should be placed in the genus *Hormodendrum*, but, because of its specific connexion with chromoblastomycosis, it is convenient to retain it in the genus *Fonsecaea*. He proposes, therefore, that it be raised to specific rank as *Fonsecaea cladosporium* (Simson) n.comb. (Syn. *Fonsecaea pedrosoi* var. *cladosporium* Simson 1946). *J. T. Duncan*

BARRACK, B. B. **Chromoblastomycosis in Queensland.** *Australian J. Dermat.* 1952, Oct., v. 1, No. 4, 207–13, 2 figs.

The first properly authenticated cases of chromoblastomycosis in Australia were reported in 1946 by SAXTON *et al.* [this *Bulletin*, 1946, v. 43, 1169]. Nevertheless, the disease had been known, under various names, for many years previously to practitioners in Queensland where, apparently, it is not rare.

The present author estimates that he has seen at least 40 cases of chromoblastomycosis since 1927 ; in about 12 of these the diagnosis has been confirmed by histological examination and in the more recent cases by culture also. The recognized cases have occurred chiefly in an area between the eastern Queensland coast and the western fall of the coastal range, in a well-timbered region with a humid climate. The disease develops very slowly, so that it is possible, by measurement, to estimate the age of the lesions. The large cauliflower growths of the " mossy foot " type have not been found in Australia, and the common lesions, although frequently verrucose, are but little raised

above the level of the surrounding skin. They are brownish-yellow in colour, often warty and papillomatous, spreading by peripheral growth and sometimes surrounded by small satellite lesions. They tend to bleed from slight trauma and, especially in the more papillomatous forms, a little pus can sometimes be expressed on the surface by pinching. Pruritus may be a symptom of the more active forms but the lesions are usually entirely painless and, for this reason, they are seldom presented for medical examination until they are far advanced. Lymphatic blockage may occur and cause local elephantiasis.

The histological picture is similar to that of chromoblastomycosis in other countries, but it is suggested that the micro-abscesses in the dermis are due to secondary infection from the surface and it is stated that carcinomatous change occasionally occurs in old lesions.

For treatment, surgical excision or electro-coagulation could be applied only to the smaller lesions, and local irradiation with X-rays or radium combined with intensive internal iodide therapy was found to be the most effective procedure. The X-ray treatment may be given as a single dose of about 2,000 r. or in divided doses. Before irradiation, the papillomata may be reduced in size by the application of hot compresses of 1 : 5,000 perchloride of mercury three times daily followed by 12 per cent. ichthyol in glycerin. These applications may also be continued after the irradiation.

J. T. Duncan

TROPICAL OPHTHALMOLOGY

FEIGENBAUM, A. **Causes of Blindness in Israel.** *Acta Med. Orientalia.* 1952, Aug.–Sept., v. 11, Nos. 8/9, 149–57.

Prior to 1948 there were approximately 625,000 Arabs and 650,000 Jews in mandated Palestine. At the end of 1951 in the same area which now constitutes the State of Israel there were 173,000 Arabs and 1,404,000 Jews. In sample surveys of the blind of 10 Arab Moslem villages, STRATHEARN in 1931 found 14 per 1,000 totally blind in northern Palestine and 29 per 1,000 in the south. An analysis of 1,118 blind eyes in the Strathearn series showed that in 74·5 per cent. of them acute ophthalmias were the cause of blindness. This was in complete accord with the findings of previous investigators, who insisted that about 75 per cent. of all causes of blindness were the result of acute ophthalmias with a maximum onset in the first decade of life. The remaining blind eyes were due to : fevers (measles and smallpox) over 10 per cent. ; cataract 5 per cent. ; primary glaucoma almost 5 per cent. ; injury 2·5 per cent. ; fundal changes almost 2 per cent. ; and congenital conditions 0·5 per cent. In the Jewish settlements whether in towns or in villages Strathearn found no problem. Smallpox has now ceased to have any significance as a cause of blindness in Palestine owing to compulsory vaccination, and in the last decade no cases have been reported.

Under the State of Israel at the end of 1950 the total number of blind persons amounted to 620, *viz.*, 440 Jews and 180 Arabs. These figures are incomplete and probably incorrect, but no more reliable data are available. Thus at the end of 1950 there were 0·37 per 1,000 totally blind among the Jews and 1·1 per 1,000 among the Arabs, a ratio of 1 : 3. In 1931 this proportion was 1 : 8. This change may be explained by the relatively large immigration, mostly from Arab countries, of destitute Oriental Jews. The latest estimate in 1952 is around 1,000 blind people altogether in the country. During the past 3½ years (until the end of 1951) 684,000 Jews immigrated into Palestine. The Yemenites

and the other Jewish Orientals, 48,000 and 238,000 respectively, form two-fifths of the total immigration and are the most heavily affected with blindness as well as with trachoma. At present there are as yet no reliable statistics, and figures have to be relied upon from the out-patient departments of the hospitals. The leading causes of blindness are still the acute ophthalmias. The great majority of the Jewish blind today in Israel, whatever their numbers, in contradistinction to the Arab blind, are imported, and are in no way a product of actual conditions prevailing among the Jews in Israel. Thus the problem to a large degree becomes limited to a sector of recently immigrated Oriental Jews and the Israeli Arabs.

The author points out that owing to the continuous arrival of newcomers, the direct campaign against trachoma as well as against all infective ophthalmias is of primary importance. The anti-trachoma services have to be in a process of continual expansion. Expert medical supervision of schoolchildren with treatment of those affected, is carried on, and the cases are followed into families by social service workers. He also points out the importance of good hospitals and the training of good eye specialists. Legislation will have to be promoted with regard to avoidable eye diseases in general and to compulsory notification of infectious eye diseases. *E. W. O'G. Kirwan*

Boase, A. J. **Blindness in Uganda.** *East African Med. J.* 1952, Aug., v. 29, No. 8, 311–18.

The commoner conditions which eventuate in blindness are discussed by the author.

According to the British Empire Society for the Blind the incidence of blindness in the East African colonies is estimated at 1 per cent. of the native population. The present information available is not of much use from a statistical point of view and the only survey so far carried out is sketchy and the results are inaccurate. A vast proportion of the cases of blindness seen by the author at his hospital should never have occurred. The majority fell into the group of corneal blindness, the sequela of ulceration usually caused by some form of purulent or mucopurulent conjunctivitis. The conjunctivitis is of a type that in the course of 2 or 3 weeks may lead to total destruction of both corneae ; it is endemic and at times epidemic.

Trachoma is responsible for more ocular disability and blindness than any other single cause in Uganda and the economic loss that it causes must be colossal. Diseases of the iris and ciliary body rank high among the blinding diseases and the aetiology of many of the cases remains obscure. Senile cataract is as common as it is elsewhere but so many blind from this disease do not reach hospital for operation. Juvenile cataract is relatively frequent and its aetiology at present unknown. Primary glaucoma accounts for much of the incurable blindness in old people and younger people appear to be susceptible to chronic simple glaucoma to a greater extent than in other countries. Secondary glaucoma also ranks high as an ultimate blinding factor. Primary optic atrophy is not uncommon and it is often difficult to determine the cause. The suddenness of the affliction suggests the possibility of a viral origin.

Finally, as a cause of blindness in Uganda, onchocerciasis occurs, mostly in eastern Kyagwe and Busoga, but the dread of this disease should now belong to the past since the advent of hetrazan which is so successful in treatment.
E. W. O'G. Kirwan

Diab, A. E. & Abu-Jaudeh, C. N. **Aureomycin in Trachoma.** *Amer. J. Ophthalm.* 1952, Aug., v. 35, No. 8, 1187–90.

This article is based on the examination of 20 trachoma patients treated with aureomycin in Beirut. All the patients were Lebanese children 4–8 years of

age who had had no previous treatment and were typical cases of trachoma II (MacCallan) with an admixture of follicles, bleb-like excrescences which burst on pressure and a pannus at least 4–5 mm. wide. Thus no doubtful cases were included. The first series of 10 patients were treated with hourly instillations, 12 instillations per day, of 0·5 per cent. aureomycin borate solution into the conjunctival sac for a period of 12 days. The second series of 10 other patients were treated with local applications of aureomycin hydrochloride ointment 1·0 mgm. per gm. of base every two hours for 12 days, together with one aureomycin hydrochloride capsule (250 mgm.) every 6 hours for 12 days. After 12 days of treatment the follicles, bleb-like excrescences and the pannus were essentially unchanged. Secondary bacterial invaders were promptly eliminated after 48 hours of therapy.

According to the experience of the authors aureomycin administered as described did not seem to exert any effect on trachoma in these selected Lebanese cases. *E. W. O'G. Kirwan*

TOULANT, P. & BOITHIAS, M. Les lésions du fond d'oeil dans l'onchocercose africaine. [**Lesions of the Fundus of the Eye in Onchocerciasis in Africa**] *Bull. Acad. Nat. Méd.* 1952, v. 136, Nos. 22/23, 378–83. [10 refs.]

Early workers pointed out that the ocular manifestations of onchocerciasis were punctate keratitis and iritis and that many patients with a normal pupil were completely blind. No mention was made of the fundus of the eye. Lesions of the choroid, retina and optic nerve were reported much later, first in Africa and then in America, and they occurred in old cases of the disease where there were numerous nodules. Some workers denied the existence of optic nerve atophy without the presence of other ocular signs, while others found choroiditis in the early stages of the disease without any nodules and optic atrophy without choroiditis or any involvement of the anterior segment of the eye.

In this article Toulant and Boithias discuss the lesions they have found in the fundus of the eye in onchocerciasis. Choroido-retinitis was manifested by varied and extensive signs. Disease of the choroid was more common, pigmented particles of various forms and signs alternated with white patches of choroidal atrophy. The small spots gave the appearance of fine powdered salt on a red background. The larger spots were round with sharp margins, white or yellow in colour, often in clusters resembling a bunch of grapes and in close association with the blood vessels. They lay in the choroid and resembled the lesions of the eye seen in tuberculosis. They might be produced by lymphocytic reaction around one or more microfilariae and were analogous to the spots of onchocercal punctate keratitis. This hypothesis as yet remains to be proved.

Retinal lesions were rare, but light, white translucent veils were seen, apparently due to oedema of the retina which accompanied the choroiditis. Small retinal haemorrhages more often at the posterior pole were occasionally seen and in 3 cases pigmentary retinitis.

Optic neuritis or papilloedema were not seen but optic atrophy both primary and secondary to choroiditis was common. Primary optic atrophy was often accompanied by blindness and if the anterior of the eye was normal, the pupils were dilated and inactive. Patients with optic atrophy often showed little evidence of onchocerciasis such as some small subcutaneous nodules or even only one. The aetiology was confirmed by the presence of microfilariae in the biopsy of the skin or conjunctiva. In young subjects or recent infestation the diagnosis required repeated examinations. The aphorism

"no onchocerciasis without nodules" did not always appear to be correct. In some cases no nodules were found, in others they were so small that they could not be found by palpation. The presence of microfilariae in the skin or conjunctiva was only found after repeated examinations. Slit lamp microscopy more often showed the presence of microfilariae in the anterior chamber of the eye. When the optic atrophy was established peri-arterial sheathing in spindles more or less drawn out or as white lines encircling a thin column of blood was frequently observed. In a more advanced stage the artery was represented by a white track and appeared completely obliterated. Periphlebitis was not seeen. The peri-arterial thickening appeared to be due to the penetration of the microfilariae into the sheaths of the central blood vessels, but although very common in onchocerciasis it is not a diagnostic sign as it occurs in other diseases. In some cases of optic nerve atrophy a juxta-papillary membrane was seen and was probably of inflammatory origin. Optic atrophy secondary to choroiditis was frequently seen and the most typical choroiditis was a pigmentary and juxta-papillary one, otherwise very uncommon.

In a well equipped ophthalmological clinic the authors are of opinion that the diagnosis of onchocerciasis is easy. The corneal microscope reveals the punctate keratitis, dead embryos in the cornea and often living ones in the aqueous humour. The electric ophthalmoscope reveals the lesion of the fundus and these are characteristic enough to be distinguished from those of trypanosomiasis and syphilis. The ophthalmoscope with magnification of +30 dioptres reveals the early nummular corneal opacities and even the microfilariae, but the latter are difficult to find. Biopsy of the skin or conjunctiva reveals the presence of microfilariae and helps to follow the results of treatment.

The authors consider that the ocular lesions were due directly to the microfilariae and not to superimposed infections or nutritional defects. Living embryos cause no reaction in the tissues but dead ones set up leucocyte infiltration.

In treatment they recommend removal of the nodules as soon as possible and administration of hetrazan [notezine] in a dose of 6 mgm. per kgm. (about 400 mgm. total) a day for 10 days, or smaller doses if a reaction occurs (which may be severe). Four courses with 15 days' intervals brought about a rapid disappearance of the embryos and a rapid improvement in the ocular lesions. Finally the authors are endeavouring to devise treatment by local therapy with weak solutions of notezine in the form of drops, subconjunctival and even retrobulbar injections. They also advise local therapy with lamellae of notezine which would have more prolonged action than the instillations.

The gravity of onchocerciasis has been for a long time recognized in Africa; the disease is responsible for a large amount of blindness. In the infested areas often 50 per cent. of the population have nodules and 10 per cent. or more are blind. Methodical examination of persons with onchocerciasis shows that embryos can exist in the conjunctiva and aqueous humour without producing any defect in the eyes, but later many such persons develop serious eye lesions. It is important to diagnose and treat the disease in the early stage and so prevent the onset of choroiditis and optic atrophy. Examination of the eyes will often lead to a diagnosis before the appearance of nodules and lesions of the skin. *E. W. O'G. Kirwan*

HEAT STROKE AND ALLIED CONDITIONS

HEFFERNON, G. A., HITTNER, H. J. & KOCIS, S. L. **Effective Temperature as a Measure of Heat Effect.** *U.S. Armed Forces Med. J.* 1953, Jan., v. 4, No. 1, 73–80, 1 fig.

In June and July 1952 the temperatures at Fort Lee, Virginia, reached record heights, and advice was often sought as to when the daily post activities should be stopped so as to reduce the number of heat casualties.

Effective temperature was taken as the index of the combined effects of air temperature, humidity and wind speed, and the numbers of heat victims treated in hospital each day were studied in relation to the prevailing effective temperatures. On a day in June the effective temperature reached 84°F., and 8 patients were treated in dispensaries. Two days later 21 patients reported when the effective temperature reached 85·5°F. Thereafter temperatures were lower for 3 weeks or so, and there were few heat patients, but then on 3 successive days the effective temperature reached 84·5° to 85·5°F. and the numbers of patients on the 3 days were 22, 43 and 42. At this time it was decided that training activities would be suspended when the effective temperature reached 83°, and a day or two later, when on two successive days the effective temperature mounted to 84° and 85°F., and training was stopped, the numbers of patients were only 2 and 3. *Thomas Bedford*

TROPICAL ULCER

CARAYON, M., LAHITTE, F. G. & D'ALMEIDA. Les ulcères phagédéniques cancérisés en Afrique Noire. [**Cancerous Changes in Tropical Ulcers in Africa**] *Méd. Trop.* Marseilles. 1952, Sept.–Oct., v. 12, No. 5, 497–521, 10 figs.

It is only since 1947 that attention has been drawn to the frequency with which the phagedaenic ulcer commonly met with in Africans becomes malignant; in some series of reported cases it forms 10 per cent. of all cancer cases seen. The present paper is a study of 24 patients seen by the authors in Senegal, Guinea and at Chad. Full clinical notes are given. In most the ulcer was of 5–10 years' standing and generally of traumatic origin. Four of the patients were admitted with recurrence in lymph nodes after amputation elsewhere; the remainder were primary cases. Histological examinations were made in 22 cases, of which 20 proved to be squamous-cell carcinoma, one was a basal-cell carcinoma and one was a fibrosarcoma. The majority of the patients were 20–40 years of age, in contrast to the higher ages at which cancer attacks the skin in Europeans. The duration of the ulcers varied from 5 to 22 years, but in one case was 6 months only. Phases of cicatrization alternated with relapses.

The site of the ulcer was on badly nourished tissues, there was vitamin A and C deficiency and hypoproteinaemia, factors favouring malignant transformation; but, as the authors point out, in Europe and North America the common varicose ulcer, subject to the same factors, rarely undergoes malignant transformation, a racial difference perhaps comparable to the frequency of cirrhosis of the liver and the rarity of primary cancer of the liver in the white races. Gross postural deformities of the joints of the lower limb were produced by tendon and skin retraction, but septic complications rarely occurred. The ulceration involved bone in 7 of the 24 cases, apart from periostitis and surface necrosis. Involvement of the regional lymph nodes, probably embolic, was present in 8 of the 24 cases, but distant metastases were rare.

The treatment of election is by amputation through the thigh with complete excision of the inguino-iliac group of lymph nodes in the groin ; the extent of the latter will vary according to the extent of involvement of the various groups of nodes, but if possible should be done at the same time as the amputation, though in subjects in poor condition with extensive and fixed masses of lymph nodes this may not be practicable. Patients coming to hospital with lymph node recurrence after simple amputation often have masses extending up towards the bifurcation of the aorta, but even in these cases operation may avert death from ulceration of the iliac or femoral arteries. If the patient refuses amputation the ulcer may be excised and grafted, with excision of the lymph nodes as a palliative treatment, provided that the ulcer does not involve bone.

Of the 24 patients 5 refused amputation or died before operation could be undertaken, 3 underwent amputation with excision of lymph nodes, there was one disarticulation of hip joint, 9 amputations of thigh, 5 amputations of leg and one disarticulation of knee joint. There was no operation mortality and 13 of the 19 patients operated upon left hospital alive ; the subsequent fate of these patients is uncertain but 10 of the 24 are known to be dead. Follow-up of hospital patients under African conditions is almost impossible, unless they return to hospital with recurrences. The paper is illustrated by 10 reproductions of photographs and skiagrams. *W. L. Harnett*

MISCELLANEOUS DISEASES

Bertazzi, C. G. Su una particolare sindrome enterocolitica osservata nell'altopiano africano (Scioà) nell'europeo in corso di acclimatazione. [**An Idiopathic Type of Enterocolitis Observed in Europeans when They First Stay in the Ethiopian Highlands**] *Arch. Ital. Sci. Med. Trop. e Parassit.* 1952, Oct., v. 33, No. 10, 579–85. English summary.

The altitude involved is about 2,840 m. (about 9,315 feet) above sea level and the author who is a medical practitioner at Debrà Berhàn gives a personal account of an attack which he experienced within about a month of arrival. He suffered acute abdominal pains spreading from the umbilical region and accompanied by the passage of loose stools, mostly blood and mucus. Specimens which he examined fresh and after staining with iodine and by other techniques failed to show any parasites in either vegetative or cystic forms ; fat digestion seemed inadequate and there was much vegetable and meat residues. There was intense thirst, some headache, no vomiting or nausea, and the abdomen soon became too generally tender to allow of any examination by palpation. After 2 days, the patient was admitted to hospital in Addis Ababa (which, the author states, is at the lower altitude of 1,500 m. [4,920 feet. Addis Ababa itself is at 8,000 feet ; the hospital was presumably out of the town]) where examination failed again to show any specific parasite. The liver was enlarged, 3 fingerbreadths beyond costal arch, and somewhat tender. A wide range of clinical and laboratory investigations proved negative. Recovery was complete and uneventful within 10 days.

The author has since seen the same manifestations in a number of other new arrivals from Europe and he believes the phonemonon to be one of acclimatization. He suggests that recovery is aided by a temporary change to a somewhat lower altitude. *J. Cauchi*

DUNLOP, S. J. C. **Rapid Recovery in a Case of Melioidosis.** *Documenta Med. Geograph. et Trop.* Amsterdam. 1952, Dec., v. 4, No. 4, 296–300. [14 refs.]

It is generally accepted that a very high mortality rate occurs in melioidosis ; the great majority of the 300 cases already described have been diagnosed at post-mortem examination. As no epidemiological relationship has been established between cases, it is possible that a milder unrecognized form of the disease exists. Practically all those reported have had their origin in South East Asia. There are no specific symptoms, and diagnosis on clinical grounds is practically impossible. *Pfeiferella whitmori* may be recovered from the blood of moribund patients, but the usual method of diagnosis is cultivation of the pus from an internal organ after death. Diagnosis by agglutination is of little practical value as death occurs before the patient has formed antibodies.

Is the mortality high because only the very malignant cases are diagnosed, and these post mortem ?

In the reported case of a 28-year-old European woman *Pf. whitmori* was found during life as a result of a favourable combination of circumstances. Operation was performed for lower abdominal pain simulating appendicitis. At laparotomy a small ovarian cyst was found ; it burst when its removal was attempted. Bacterial examination of the contents produced a culture of *Pf. whitmori*.

Titration experiments revealed a high degree of sensitivity to aureomycin (total inhibition 0·01 μgm./ml. in 24 hours), and a lesser susceptibility to the action of penicillin (0·03 u/ml. in 24 hours). It was relatively insensitive to chloramphenicol and streptomycin.

A limited amount of aureomycin was available—5 gm. spread over 2½ days. Twenty-four hours after beginning treatment with aureomycin the temperature was normal and pain disappeared. Aureomycin was followed by 50,000 units of penicillin, 8 times a day for 3 weeks. Nine months later the patient was still well.

The patient lived in a rat-infested room. Rats are easy to infect and excrete the bacilli in their urine, but no infected rats were found in the patient's room.

There are probably several strains of *Pf. whitmori* with differing sensitivity to aureomycin, chloramphenicol and the sulphonamides, thus accounting for different conclusions reached by other investigators. *George R. McRobert*

DAVIES, J. N. P. **Recent Advances in Tropical Medicine. No. 4. Primary Carcinoma of the Liver in Uganda Africans.** *West African Med. J.* 1952, Oct.–Nov.–Dec., v. 1 (n.s.), No. 4, 141–52. [37 refs.]

No one is yet in a position to state the incidence and types of cancer in Africans in the cancer age-groups, but the astounding frequency of primary liver carcinoma in young Africans is shown by figures from all over Africa south of the desert belt. FINDLAY [this *Bulletin*, 1951, v. 48, 85] found a cancer incidence in male West African troops aged 18–40 years of 26·4 per 100,000, whereas in the same areas among 50,000 European troops of a slightly higher average age the incidence was 12 per 100,000 ; the excess of cancer in the Africans was entirely due to the occurrence of 37 cases of carcinoma of the liver among the 60 cancer cases.

In this paper the author reviews the cases of primary carcinoma of the liver which have come to autopsy at Mulago Hospital, Uganda, between January 1946 and February 1952. This hospital admitted about 14,000 patients a year to all departments, who came from wide areas of East Africa, the Congo and the Sudan. There were 2,718 autopsies, 2,282 of males and 436 of females ; among them were 42 cases of primary carcinoma of the liver, 38 males and 4 females,

of which 9 were of the cholangio-cellular type and 33 of the hepato-cellular type. The majority of the deaths took place under the age of 40, but statistical investigation showed that the proportion of all autopsies showing carcinoma of the liver in males did not vary significantly with age, it was merely a reflection of the comparative youthfulness of the population at risk. Cholangioma formed 0·35 per cent. of male autopsies and 0·2 per cent. of female autopsies, while hepatoma formed 1·3 per cent. and 0·7 per cent. respectively. There was no significant difference between the sexes in the frequency of cirrhosis of the liver, 4·4 and 3·5 per cent. respectively. The statistical analysis of the relationship between cirrhosis and carcinoma of the liver led to the following conclusions :—(1) There is no difference between the incidence of the two types of carcinoma in persons with no cirrhosis ; (2) if post-necrotic scarring is present hepatoma is significantly more frequent than in persons with no cirrhosis ; (3) if Laënnec cirrhosis is present both cholangioma and hepatoma, especially the latter, are significantly more frequent than in persons with no cirrhosis.

The author considers that the experimental production of liver carcinoma in animals by the administration of synthetic carcinogens and dyestuffs has little relevance to African carcinoma of the liver, as there is no evidence, clinical or pathological, in the latter of liver necrosis or regeneration. All the evidence points to the fact that the cirrhosis precedes the carcinoma for a long period and that poor diet may be a factor in the production of the former, though it alone will not produce liver cancer. In the author's view oestrogens, which are capable of producing hepatoma in animals and carcinoma of the breast in male mice, probably play an important part in the production of liver cancer. Carcinoma of the male breast, gynaecomastia and other signs of feminization in male Africans are, he considers, signs of failure of the liver to detoxicate endogenous hormones, and it is possible that it may be unable to detoxicate some carcinogens perhaps derived from food.

[This is an important paper, particularly for the autopsy figures, and the statistical investigations which place cancer of the liver in proper perspective. See also this *Bulletin*, 1948, v. 45, 814 ; 1950, v. 47, 85.] *W. L. Harnett*

STEYN, D. G. & VENTER, I. D. **The Toxicity of *Rhoicissus cuneifolia* (E. & Z.) Planch. (Wild Grape " Wilde Druif ").** *South African Med. J.* 1953, Jan. 17, v. 27, No. 3, 64–6, 2 figs.

The name " wild grape " is given to more than one plant, namely the subject of this paper, *Rhoicissus cuneifolia*, and *Cissus crameriana*. Though the berries of the former are edible, the rootstock contains a potent and rapidly acting poison. It is apparently likely to be mistaken for the wild Sweet Pea, *Spenostylis* (*Vigna*) *angustifolia*.

The case recorded was tragic in its intensity and acuteness of symptoms. An African ate a few mouthfuls of the rootstock ; in half an hour he felt weak and unable to stand and 5 minutes later fell on his side ; he salivated but did not vomit. He soon lost consciousness and respiration ceased, the pulse rate falling to 52, but regular though weak ; the pupils did not react to light and there was no corneal reflex ; tendon reflexes were abolished and there was general flaccid paralysis. His stomach was washed out and nikethamide injected intravenously ; breathing returned, deep and slow, but death occurred from respiratory paralysis 3 hours after ingestion of the rootstock. Another member of the same labour gang began to eat the rootstock, but spat it out as it burned his mouth and he made himself vomit by thrusting his finger down his throat ; he recovered.

The course of symptoms following intragastric administration of 15 gm. of fresh rootstock to a 3·5 kgm. rabbit is graphically described. Within half an hour, deep, regular but laboured respiration set in and there was lowered sensitivity to skin-pricks ; heart action at first strong and regular, later became very rapid, irregular and weak. In 45 to 60 minutes paresis and paralysis set in, the animal staggered on attempting to move ; in another 15 minutes the paralysis was complete ; corneal reflex was at first reduced but soon abolished and unconsciousness was complete with relaxation of sphincters ; respiration became very rapid and abdominal ; then, about 2 hours after the administration, it became laboured and slow, with gasps every 8–10 seconds and death occurred in coma and paralysis in 3–4 hours. Some animals, when apparently *in articulo mortis* with coma, muscular and threatened respiratory paralysis, would recover and that fairly rapidly. The heart continued to beat after respiration ceased ; respiration might then return and again fail. At autopsy there was some hyperaemia of the lungs with marked emphysema and pleural petechiae, and the parenchymatous organs were very congested. In protracted cases the mucosa of the stomach and small intestine was hyperaemic, but in acute cases signs of gastro-intestinal irritation were absent.

The importance of impressing upon people generally, and especially children in the schools, how to distinguish between edible and poisonous wild plants is duly stressed. The next point should be the determination of the toxic principle and the finding of an antidote, which would have to be close at hand as the course to a fatal issue is so acute. *H. Harold Scott*

PROTOZOOLOGY : GENERAL

RACCUGLIA, G. La toxoplasmosi. [**Toxoplasmosis**] *Ann. d. San. Pubblica.* Rome. 1952, Mar.–Apr., v. 13, No. 2, 425–516, 16 figs. & 1 folding map. [609 refs.] English summary (5 lines).

For some years, after its first discovery in 1939, human toxoplasmosis was thought to be a rare disease with a restricted geographical distribution, but during the last decade it has been demonstrated that infections with *Toxoplasma gondii* are widespread throughout the world. Though this disease is of considerable medical importance, in the absence of precise knowledge regarding the life-cycle of the parasite and its transmission, and of effective drugs, no methods of control and treatment are so far available.

The present paper gives a comprehensive review of present knowledge of all aspects of toxoplasmosis. After a brief historical introduction, the geographical distribution of the disease (illustrated by a map) is dealt with, after which a description is given of the morphology and development of the parasite *in vivo* and *in vitro*, as well as in experimental infections of animals. Provisionally one species of *Toxoplasma* is recognized in the different hosts from which it has been recorded : these are listed in a Table. A section is devoted to immunology and serology of toxoplasmic infection.

An account is then given of the course of infection and pathological changes in different animals, culminating in a description of the disease in man, and of the serological methods used for its diagnosis. This is followed by a consideration of the effects of chemotherapeutic and antibiotic agencies upon the infection, after which its epidemiology is discussed.

The copious references in the text to a bibliography comprising 609 entries should enable the reader to follow up any question dealt with to its original source. *C. A. Hoare*

NÁJERA, L. E. Las toxoplasmosis : su importancia epidemiológica y sus relaciones con la embriopatía rubeólica. [**Epidemiological Importance of Toxoplasmosis and its Relation to Congenital Defects as Seen in Rubella**] *An. Med. Pública.* Santa Fe. 1952, Jan.–June, v. 4, Nos. 1/2, 111–86, 2 pls. [136 refs.]

A very full review and discussion.

DE GAVALLÉR, B. Toxoplasmosis humana en Venezuela. Presentación de los tres primeros casos congénitos. [**Human Toxoplasmosis in Venezuela : First Three Congenital Cases**] *Archivos Venezolanos de Patol. Trop. y Parasit. Méd.* 1950, Jan., v. 2, No. 1, 265–96, 6 figs. [61 refs.] English summary.

The greater part of this paper is devoted to a review of our knowledge of human toxoplasmosis. An account is then given of the first 3 cases of congenital toxoplasmosis reported from Venezuela. Two were prematurely born infants, who died 4 and 60 hours respectively after birth, while the third was still-born. Two of them showed symptoms of generalized congenital toxoplasmosis with typical cerebral and visceral lesions, while in the third cerebral calcification and internal hydrocephalus were present as well. In one of the infants parasites were found in the brain, spinal cord, adrenal glands and skeletal muscles.

C. A. Hoare

MÜHLPFORDT, H. Das Verhalten von *Toxoplasma gondii* (Stamm Bk) in der Gewebekultur. [**Behaviour of *Toxoplasma gondii* in Tissue Culture**] *Ztschr. f. Tropenmed. u. Parasit.* Stuttgart. 1952, Oct., v. 4, No. 1, 53–64, 13 figs. [17 refs.]

The author describes the cultivation of a human strain of *Toxoplasma* which has been maintained by mouse passages. The culture medium consisted of equal parts of hen plasma and diluted extract of 9-day chick embryos, with a *p*H of 7·2. The tissue used was skeletal muscle (with or without cartilage) of 10-day-old chick embryos. The tissue culture was grown on coverslips at 37°C., with transfers into fresh medium every 2 days. The parasites were inoculated as follows : fragments of cultivated tissue were placed in hollow-ground slides, containing peritoneal exudate of an infected mouse with free parasites. After exposure for 15–20 minutes, the infected tissue fragments were removed and cultivated in the usual way on coverslips. Observations of the behaviour of the parasites were made in fresh preparations with the aid of phase contrast microscopy, and in stained preparations.

In these cultures the parasites multiplied abundantly in the tissue cells, in which they were frequently arranged in the form of rosettes, while others were lying outside the cells. Pseudocyst-formation was also observed. The free parasites were motile, but their penetration into cells was not observed. Within the nucleus of the parasites a central karyosome was seen.

The appearance of the parasites in tissue cultures is clearly illustrated in a series of photomicrographs. *C. A. Hoare*

KNAPP, W. Über Desinfektionsversuche am Erreger der Toxoplasmose. [**Disinfecting Experiments on the Causal Agent of Toxoplasmosis**] *Zent. f. Bakt.* I. Abt. Orig. 1953, Jan. 24, v. 159, No. 3, 226–31.

Carrying out the Sabin-Feldman test exposes the laboratory worker to the risk of infection with *Toxoplasma gondii* through handling the peritoneal exudate of infected mice. Experiments were made with this ascitic fluid which was mixed with various concentrations of Sagrotan, Zephirol or chloramine. The liquid was diluted with saline, or with a sodium thiosulphate solution when chloramine was being examined, then centrifuged and the sediment was injected

into mice. The disinfectants were tested in concentrations ranging from 0·01 to 2·0 per cent. for periods of from 2 to 5 minutes. None of these disinfectants could be relied on to kill the organism in the stated concentrations and periods of time. There was some evidence that the virulence of the organism was lowered by these disinfectants, for the survival times of mice injected with the " disinfected " ascitic fluid were longer than those of the controls.

M. E. Delafield

Schultz, W. & Bauer, H. Experimentelle Toxoplasmose. (Placentarbefunde bei Ratten.) [**Experimental Toxoplasmosis : Parasites in the Placentas of Rats**] *Klin. Woch.* 1952, Sept. 15, v. 30, Nos. 35/36, 850–51, 4 figs.

In order to throw light on the mode of infection in congenital human toxoplasmosis, the authors infected 40 pregnant rats from 14 to 5 days before parturition with inocula of 0·02 cc. of a suspension of toxoplasms. The rats, which acquired a latent infection without any clinical manifestations, were killed one day before the expected parturition. The examination of all their organs revealed only isolated parasites, while none could be detected in the foetuses. However, pseudocysts were present in the placenta. From these observations, it is concluded that in women suffering from a latent toxoplasmic infection pregnancy stimulates the development of the pseudocysts, releasing the parasites, which find their way into the maternal blood stream and into the cells of the Langhans layer, which they reach by the fourth month of pregnancy. Thence they penetrate into the stroma of the foetal villi and finally into the foetal blood stream.

C. A. Hoare

Hamperl, H. Zur Frage des Parasitennachweises bei der interstitiellen plasmocellulären Pneumonie. [**Parasitological Findings in Interstitial Pneumonia**] *Klin. Woch.* 1952, Sept. 15, v. 30, Nos. 35/36, 820–22, 2 figs. [11 refs.]

The recent discovery, by Vaněk and Jirovec [this *Bulletin*, 1952, v. 49, 194, 908], of *Pneumocystis carinii* in the lungs of 7 infants who died with symptoms of interstitial pneumonia, has prompted the author to re-examine sections from similar cases, made in 1937 at the Berlin Pathological Institute. Using the periodic acid-leucofuchsin method of McManus and Hodgkiss the author was able to confirm the presence in this material of the same parasites, which formed agglomerations filling the lumen of alveoli and bronchi, together with epithelial cells and leucocytes. In addition to the hepatized parts of the lung, in which the parasites were predominant, small groups and single parasites were also present in sound alveoli, where they were associated with cellular infiltrations of the septa.

C. A. Hoare

Herzberg, K., Herzberg-Kremmer, H. & May, G. Über *Pneumocystis carinii* bei interstitiellen Pneumonien. [*Pneumocystis carinii* **in Interstitial Pneumonia**] *Klin. Woch.* 1952, Sept. 15, v. 30, Nos. 35/36, 822–4, 4 figs.

The authors describe cases of infection with *Pneumocystis carinii* in 9 prematurely born infants, who died of interstitial pneumonia. Sections and smears of the lung revealed the parasites and their cysts between the epithelial cells of the alveoli, histiocytes, connective tissue cells and blood corpuscles. The parasites were frequently grouped together in foam-like agglomerations, in which rounded uninucleate forms and cysts with up to 8 nuclei were present. In some cases single or several parasites occupied an intracellular position within

histiocytes. Attempts to infect laboratory rodents with the human *Pneumocystis* produced negative or doubtful results. The appearance of the parasites in the tissues is shown in photomicrographs. *C. A. Hoare*

ENTOMOLOGY AND INSECTICIDES : GENERAL

[Papers on the toxic effects of insecticides in man are abstracted in the *Bulletin of Hygiene* under the general heading of Occupational Hygiene and Toxicology.]

COLONIAL OFFICE. **Colonial Research 1951–1952. Colonial Insecticides, Fungicides and Herbicides Committee. Fifth Annual Report (1951–1952)** [HALL, W. J., Chairman] (pp. 189–214). Cmd. 8665. 253 pp. 1952, Sept. London : H.M. Stationery Office. [6*s.* 6*d.*]

The first two sections of this report are devoted to a list of members of the Committee and to a summary of the activities during the year 1951–52. The third part, reviewing research work, is divided into the following sections :

(1) *Colonial Insecticide Research Unit, Porton*

This unit is concerned chiefly with factors influencing the toxicity of residual insecticides applied to houses for malaria control. Progress has been made with insecticidal surface coatings which will retain their toxicity for many months when applied to wood or metal. The size of the DDT crystals in the " bloom " of urea-formaldehyde coatings can be controlled by changing the surface hardness of the film. The toxicity of DDT was reduced considerably when the film was hard, but volatile insecticides, such as gamma BHC or aldrin, are more effectively contained in coatings with a hard surface. Films containing pyrethrum and piperonyl butoxide paralysed and killed blood-feeding insects (*Glossina* and *Cimex*) readily, whereas carbohydrate-feeding insects, *e.g.*, *Tribolium* and *Blatta*, were paralysed by contact with the surface, but were able to recover. Preliminary experiments with attractants and repellents incorporated into urea-resin films gave encouraging results. Coatings containing up to 50 per cent. of iso-valeric acid on the resin solids, and air-dried, remained attractive to house-flies for up to 6 weeks. In field trials insecticidal surface coatings have proved effective in controlling cockroaches in ships, and coatings containing DDT have prevented barnacles from settling on wood for two years.

Work on the sorption of insecticides by dried mud has been continued. High dosages of DDT persist on mud blocks for longer periods than low dosages, but the sorption is rapid after 8 weeks. The rate of sorption was reduced considerably by a layer of limewash between the DDT and the mud.

Studies on the behaviour of mosquitoes in contact with insecticidal deposits have shown that *A. stephensi* females are irritated by contact with DDT and leave treated surfaces after approximately 4 minutes. High kills of this mosquito were obtained after a single contact only when the DDT particles were less than 10 μ in size. Other investigations at Porton include work with fluorescent tracers in aircraft sprays and also the design and development of boom and nozzle equipment and exhaust smoke-producing apparatus for aircraft spraying.

(2) *Imperial College Field Station, Silwood Park*

Work is in progress on the availability of dust deposits to walking flies and the penetration of the cuticle by DDT. Experiments with commercial dusts and

wettable powders show that the two fractions, lipoid-soluble DDT and lipoid-insoluble diluent, are picked up at different rates by walking insects. The lipoid-soluble particles are picked up more readily than the others when the insecticide is distributed on a non-waxy surface.

(3) *Rothamstead Experimental Station*

Investigations are being made of the toxicity and permanence of insecticidal deposits on plants. Glass plates coated with wax extracted from cabbage leaves were sprayed with a DDT suspension and then stored in an atmosphere saturated with DDT vapour. Plants sprayed with low concentrations of DDT increased in toxicity, but the toxicity of those with a high DDT concentration remained unchanged. Experiments proved that DDT on glass is considerably less toxic than the same DDT deposits on leaves, possibly owing to the greater humidity on a leaf surface.

(4) *Colonial Insecticide Research Unit, E. Africa*

Aircraft applications of DDT over 15 sq. miles of bush infested with 3 species of tsetse resulted, a year after the last application, in a reduction of *G. morsitans* by 99·1 per cent., *G. swynnertoni* by 95·6 per cent. and of *G. pallidipes* by 99·9 per cent. Gamma BHC smoke applied as 8 fortnightly applications over 9 sq. miles of bush reduced *G. morsitans* and *G. swynnertoni* by 93 per cent. An isolated patch of bush was treated in 1949 with BHC smoke and again in 1951 with 8 applications of 10 per cent. DDT in oil. In spite of heavy rains at the time of application no tsetse flies were found for 2 months. The application of insecticides by ground equipment to vegetation along the river Mbogo gave a spectacular reduction of *G. palpalis*. In another area of ½ sq. mile where cattle were sprayed with "Rucide" and later with DDT emulsion the number of *G. morsitans* in the area was reduced from an average daily catch of 20 in November 1951 to 0·08 in February 1952.

Experiments on malaria control in E. Africa involved both house-spraying and larviciding. The weekly application of DDT larvicides by aircraft during April and May over 5 sq. miles of creeks north of Dar-es-Salaam prevented the usual seasonal peaks of *Anopheles gambiae*. Applications of 200 mgm./sq. ft. of DDT in huts killed approximately 70 per cent. of anophelines (*A. gambiae* and *A. funestus*) entering over a 6-month period. BHC at the same dosage, on the other hand, gave a 100 per cent. kill for 5 weeks, but in this case the residue was effective for only 3 months. Dieldrin also gave a complete kill of mosquitoes entering huts over 3 months.

(5) *Malaria Control in Malaya*

The effectiveness of residual spraying with DDT and BHC and the oral administration of Proguanil was compared in 3 valleys. In all areas there was a reduction in malaria, but the rate of reduction was slowest in the valleys treated with residual insecticides.

(6) *Malaria eradication in Mauritius*

The effectiveness of residual spraying with DDT has led to the elimination of *Anopheles funestus* but not of *A. gambiae*. Although *A. gambiae* was found breeding in all areas in 1952 the malaria rate continued to fall and the adults of *A. gambiae* appeared to haunt cowsheds rather than human habitations. There is virtually no transmission in any part of the island except the Black River district in which *A. gambiae* were breeding prolifically in an unoccupied forest area. Dissections of 116 *A. gambiae* and 257 *A. coustani* yielded no positive sporozoite infections.

(7) *Herbicides and Arboricides*

Research on herbicides and arboricides is being undertaken in conjunction with tsetse research centres. Experiments to determine the use of esters of

various chlorinated phenoxyacetic acids for controlling "miombo" and "thorn bush" have been started, and also aircraft application of 2,4,5-trichlorophenoxyacetate to a strip of bush. The full arboricidal effects of these substances have not yet been assessed. Derivatives of endoxohydrophilic acids and chlorinated phenoxyacetic acids proved to be most promising in screening tests. There were striking differences in the susceptibility of different species of woody plants to defoliants.

The last section of the report draws attention to research undertaken without the assistance of the Committee. It covers investigations into the control of the Acoushi ant *Atta cephalotis* in British Guiana, trials with modern insecticides against the leaf hopper in Fiji, an investigation into the systematics, bionomics and control of stalk borers attacking cereal crops in the Gold Coast, the use of insecticides against grain pests in Kenya, laboratory experiments on seed tobacco treatment and also tsetse control studies in N. Rhodesia, the control of the white coffee borer in Tanganyika, and finally an investigation of biological control of the *Coreid* bug *Theraptus* sp. which causes premature nut fall in cocoanuts in Zanzibar. *C. Mary Harrison*

Anschau, M. & Exner, H. Faunistische und ökologische Untersuchungen an steirischen Culiciden. [**Faunistic and Ecological Investigations on the Culicidae of Styria**] *Ztschr. f. Tropenmed. u. Parasit.* Stuttgart. 1952, Oct., v. 4, No. 1, 95–116, 1 map. [Numerous refs.]

East and South-east Austria, in particular the southern and middle parts of the province of Styria, must be regarded as an extension of the South-east European region of endemic malaria. As a result of the growth of indigenous malaria in the years 1935–47, an extensive entomological survey was made. In this paper the species of mosquitoes collected are listed under the headings of 15 different localities, with brief remarks on the characteristics of each breeding place. In the remainder of the paper the biology of each species is discussed separately, illustrated by tables showing the chemical composition of the breeding waters, and the relationship of the life-cycle to the seasons.

The following species were observed for the first time in Styria : *Neoculex hortensis, N. apicalis, Theobaldia glaphyroptera, T. morsitans, Aëdes lateralis, Aëdes dorsalis, Aëdes sticticus, Aëdes cataphylla,* and *Mansonia richardii.* The three anopheline species found in Styria were distinguished as regards their breeding places, by different *p*H requirements. *Anopheles maculipennis* is tolerant of a wide range of *p*H, but *A. bifurcatus* is limited to alkaline waters, and *A. nigripes* to acid waters in tree holes. The last-named species is tolerant of a high content of ammonia nitrogen. *Aëdes ornatus* is also found in tree holes, but is widely tolerant towards *p*H. *A. J. P. Goodchild*

Bellamy, R. E. & Reeves, W. C. **A Portable Mosquito Bait-Trap.** *Mosquito News.* 1952, Dec., v. 12, No. 4, 256–8, 2 figs.

The trap is described and illustrated by photographs. It consists of a can, 12 inches in diameter and 14½ inches high, with a hole, 8¾ inches diameter, cut out from both ends. A cone of mosquito-mesh material, 5½ inches in length and with a hole, ¾ inch diameter, cut across at the point, is soldered to each end of the can so that the points project into it. That is the trap. It is baited with approximately 3 lb. of dry ice [solid carbon dioxide, see this *Bulletin*, 1951, v. 48, 1151] wrapped in heavy paper, a tear being made in this when the trap is set up. This amount lasted from late afternoon until morning. Traps were set on the ground and at different levels up to 25 feet on trees, being suspended by string or wire, sometimes horizontally, but mainly

vertically. A test showed that mosquitoes do not escape readily from these traps. Sometimes no mosquitoes entered the traps, but catches of over 1,000 have been obtained. Species taken include *Culex tarsalis* (large numbers), and *C. fatigans*, *C. stigmatosoma*, *Aëdes nigromaculis*, and *Aëdes dorsalis* in small numbers. The siting of the traps appeared to make a considerable difference in the catches, even within quite short distances of a few yards.

D. S. Bertram

GRIFFITHS, R. B. & GORDON, R. M. **An Apparatus which enables the Process of feeding by Mosquitoes to be observed in the Tissues of a Live Rodent ; together with an Account of the Ejection of Saliva and its Significance in Malaria.** *Ann. Trop. Med. & Parasit.* 1952, Dec., v. 46, No. 4, 311–19, 3 text figs. & 11 figs. on 3 pls. [12 refs.]

The apparatus is fully described and illustrated. It consists of an ordinary microscope with the stage and substage equipment removed. The tube, with usual optical parts, is set horizontally and the objective is focused on an anaesthetized mouse's ear held flat between transparent panels lying across the long axis of the tube. The mouse and panels are mounted on a modified mechanical stage so that the ear preparation can be easily moved across the field of view. A small glass tube containing a single mosquito (*Aëdes aegypti* starved for 5 days) can be brought through a hole in one of the panels directly against the side of the ear furthest from the objective. The field of view is illuminated by a " Point-o-lite " lamp beyond the mosquito-tube. Events during the feeding of a mosquito were studied by direct observation, still photography and ciné-photography, and the interpretation of events also included studies of serial sections of guineapig skin showing *in situ* the inserted mouth-parts of a feeding mosquito.

The feeding action of the mouth-parts proved to be substantially the same as those recorded in similar observations with a similar apparatus for mosquitoes feeding on the web of a frog's foot [GORDON and LUMSDEN, this *Bulletin*, 1940, v. 37, 653]. The fascicle (mouth-parts, other than palps and labium) passes below the epidermis and then flexes to run horizontally beneath it. In addition, further flexure occurs frequently nearer the tip of the fascicle, resulting in rapid exploratory probes in several directions ; in this process the labrum appears to follow a path cut by the galeae (maxillae). Occasionally these flexures do not occur ; on one occasion the unbent fascicle passed right through the ear of the mouse. In the course of these probing activities in the ear of the mouse a series of discharges from the tip of the labrum, into the tissues, of small amounts of fluid—almost certainly salivary fluid—have been seen repeatedly. During this probing process, the fascicle may puncture a capillary and be withdrawn at once with a resultant escape of blood into the intercapillary spaces to form a haemorrhage ; from this the mosquito imbibes blood by " pool feeding ". Alternatively, having penetrated into the lumen of a capillary, the fascicle extends along it, and blood is taken up directly from the vessel. Thus, the feeding of a mosquito on a mammalian host appears to be similar in mechanism and result as when feeding takes place on the batrachian host.

In this work with the denser tissue of the mouse-ear it has, however, not been possible, as was observed once certainly in the earlier work with frog webs, to determine that salivary secretion continues to be discharged once blood has been tapped either by direct or by pool feeding. But there are grounds for accepting that this does take place. What is, however, particularly clearly demonstrated with the mouse-ear is the considerable amount of salivary fluid injected into the sub-epidermal tissues before the blood supply has actually

been tapped. This observation is then discussed with regard to the possible fate of sporozoites which must be released into these tissues with the salivary secretion discharged by malaria-infected mosquitoes. Sporozoites released directly into the blood stream are, there is little doubt, those which initiate the primary pre-erythrocytic stage of the malaria parasite in the liver. It is suggested that the sporozoites deposited in the sub-epidermal tissues may not all die at the site of inoculation in a few hours ; that some may, over an indefinite period of time, gradually make their way to the liver, possibly by the lymphatic system, to undergo a late exo-erythrocytic development and contribute to the initiation of relapses. The authors note that literature bearing on this concept of delayed development of some sporozoites, although meagre and inconclusive, partly supports the view put forward.

The microscopic appearances seen with the aid of the apparatus are shown in 11 photomicrographs. *D. S. Bertram*

McLintock, J. **Continuous Laboratory Rearing of *Culiseta inornata* (Will.) (Diptera : Culicidae).** *Mosquito News.* 1952, Sept., v. 12, No. 3, 195–201. [28 refs.]

A very detailed account of a method for keeping a strain of *Culiseta* (*Theobaldia*) *inornata*, to meet the need for a laboratory culture of a common North American culicine. Experimentally, this species has been shown capable of transmitting western equine encephalitis, St. Louis encephalitis, and Japanese B encephalitis. The culture was reared at 20–21°C. Larval food consisted of brain-heart infusion, baker's yeast and whole-wheat bread crumbs ; Bates's medium (0·5 gm. calcium sulphate, 0·5 gm. sodium chloride and 1 gm. magnesium sulphate per 1 litre distilled water) was used in preference to water.

Adults were kept in cages 12 × 12 inches in area and 22 inches high. They would not feed on defibrinated, oxalated, citrated or heparinized blood alone but fed successfully, and produced fertile eggs, if provided with mixtures of such blood and a 10 per cent. sucrose solution (1 volume sucrose to 3 or 6 volumes of blood) soaked in cotton wool. The soaked wool was wrapped in gauze bags, about 1 inch in diameter, suspended in the cage. Cattle, pig or sheep blood was used. Boiled raisins were provided in similar bags. The humidity of the adult cages is not stated but appears to have been maintained at an adequate level by a tray of damp sand, covered with blotting paper, on the bottom of the cages. Growth of moulds on this blotting paper was retarded by sprinkling it with table-salt. Oviposition dishes of water had to cover at least half of the bottom of a cage, otherwise too many egg-rafts were deposited on the blotting paper. *D. S. Bertram*

Breland, O. P. **The Stirrup-Shaped Piece as an Aid in the Taxonomic Study of Mosquito Larvae.** *Mosquito News.* 1952, Dec., v. 12, No. 4, 253–5, 6 figs. on pl.

Attention is drawn to preliminary observations on the shape of the stirrup-shaped piece—a structure near the tip of the siphon of culicine larva—as a feature of diagnostic value in differentiating species of culicines in America. It may also be of value in separating the different larval instars of a species. *D. S. Bertram*

Qutubuddin, M. **The Emergence and Sex Ratio of *Culex fatigans* Wied. (Diptera, Culicidae) in Laboratory Experiments.** *Bull. Entom. Res.* 1953, Jan., v. 43, Pt. 4, 549–65, 3 figs. [23 refs.]

Statistical evidence supports the conclusion that males of *Culex fatigans* emerge earlier than females, this being due to the shorter larval life of the males ; the eggs and pupal stages of both sexes are equal in duration. There is a steady decrease in the numbers of males emerging over a series of days, but the higher percentage of males in the early batches of an experiment is found to bear no relation to the sex ratio in the total output.

Out of many experiments some showed an excess of males, others of females : the significance of individual experiments where one sex may occur in much greater numbers than the others is doubtful, and a 1 : 1 ratio over the total number of experiments seems a fair conclusion.

It seems very probable that mortality in the early stages affects both sexes equally, whereas losses in the late fourth stage must largely affect females. In early pupal stages it follows that mortality must decrease male numbers. Larval and pupal mortality below 20 per cent. does not significantly affect the sex ratio.

The effect of two types of larval food on the proportion of sexes was determined by means of yeast and egg powder, other conditions remaining constant. There is no indication of any effect either from a difference in type of food or from differences in quantity given. There also appears to be no correlation between mean temperature and sex ratio. *Anne Hudson*

Knight, K. L. & Marks, Elizabeth N. **An Annotated Checklist of the Mosquitoes of the Subgenus *Finlaya*, Genus *Aëdes*.** *Proc. U.S. Nat. Museum.* Wash. 1952, v. 101, No. 3288, 513–74. [20 refs.]

Herms, H. P. **Recent Developments in the Control of Rice Field Mosquitoes in California.** *Mosquito News.* 1952, Dec., v. 12, No. 4, 238–41.

About 300,000 acres of land in California are used for rice cultivation. The rice-fields and associated seepages, ditches and borrow pits provide extensive breeding places for *Anopheles freeborni* (vector of malaria), *Culex tarsalis* (vector of encephalitis) and *Aëdes dorsalis* and *Aëdes nigromaculis*. The nuisance effect of biting mosquitoes, apart from disease transmission, requires that control of these mosquitoes be maintained. The paper gives an account of the methods which have been tried to effect satisfactory control. The area is so vast now that use has been made of aircraft for distributing insecticide treatments.

The species of *Aëdes* have a single spring generation which can be checked successfully by adding ½–1 lb. of a 50 per cent. DDT wettable powder to each load of rice seed which is sown by dispersal from aircraft. One load sows about 6 acres. *C. tarsalis* is a pest mainly in summer and *A. freeborni* is most numerous in the autumn and, again—in the case of females which have been hibernating—in the late winter. Some success in control has followed the application from aircraft of light doses of DDT wettable powder, particularly along the edges of rice-fields ; but heavily weeded waters escape satisfactory control. Another method tried is the release from aircraft of an aerosol spray by means of an exhaust generator. One flight by an aircraft covered 400 acres. The immediate effect on anopheline larvae was a dramatic 100 per cent. kill, but within a few days new larvae appeared, adults having survived in the weedy vegetation to continue laying after the insecticide had dispersed. *Culex* adults also survived in this way but, in addition, the kill of *Culex* larvae

was negligible. Some more attention is now being paid to destroying larvae in springs, shallow lakes, and the like near rice-fields before the rice-fields are flooded. The range over which this should be done is, however, uncertain particularly in the case of *A. freeborni*.

The paper concludes with the opinion that the modern insecticides do not provide a simple, practical solution to the problems which face the rice-growing districts of California and that improvements in the design, care and usage of rice-fields must be developed. A number of points to consider are put forward. These, as the author remarks, are not new, but the ideas are sound in the face of practical limitations to control solely by insecticides.

D. S. Bertram

Sacktor, B. **Investigations on the Mitochondria of the House Fly,** *Musca domestica* **L. I. Adenosinetriphosphatases.** *J. General Physiol.* 1953, Jan. 20, v. 36, No. 3, 371–87, 6 figs. [27 refs.]

March, R. B., Metcalf, R. L. & Lewallen, L. L. **Synergists for DDT against Insecticide-Resistant House Flies.** *J. Econom. Entom.* 1952, Oct., v. 45, No. 5, 851–60. [13 refs.]

There have been one or two claims that various chemicals reactivate DDT and make it effective against DDT-resistant house-flies [Perry *et al.*, this *Bulletin*, 1952, v. 49, 561 ; Sumerford *et al.*, *ibid.*, 562]. The authors have set out to explore this situation by testing a considerable number of compounds as possible " DDT synergists ". Of 10 compounds synergizing pyrethrins, only one (piperonyl cyclonene) showed effectiveness with DDT : and this was less than the degree claimed by Perry *et al.* (*loc. cit.*). Ninety-six other compounds were tested in combination with DDT against the " Super-Pollard " resistant strain of house-flies. The tests were done by micro-syringe application of 1 cmm. acetone containing 5 per cent. DDT and 1 per cent. compound to each fly. Sixteen compounds were found to increase the activity of DDT between 20 and 160 times. [The method of calculation is not stated.] Many of these effective compounds showed some analogy to the DDT molecule in possessing two *p*-chlorphenyl groups. These were connected by various linkages, the significance of which is discussed.

Four of the more promising synergists were tested at various ratios to the DDT from 1 : 100 to 10 : 1. It was found that synergistic activity increased in all cases with increasing ratio of the compounds to DDT ; but even with a 10 : 1 ratio it was not possible to reactivate the DDT to the level of its toxicity to susceptible flies.

Tests with two of the synergistic compounds showed that both of them activated DDT even if applied separately, as much as 24 hours before or after the DDT, especially if the DDT were applied first and the synergist later.

Four of the synergistic compounds were tested with methoxychlor, which is more toxic than DDT to the " Super-Pollard " fly strain. The effect of the synergists was similar, though smaller than with DDT. Two of these compounds were combined with DDT in tests against susceptible house-flies and were found to have no activity ; in fact they slightly depressed its toxicity.

Nineteen small-scale field trials, of 4 of the new compounds, were carried out at 2 dairies and 2 pig farms infested with highly resistant house-flies. Typical trials employed about 20 lb. DDT plus 4 lb. synergist. Spray applications made in the usual way gave satisfactory fly control for 2–4 weeks in some cases and up to 6–8 weeks in others. The authors consider the results as good as any obtained by insecticides since DDT resistance developed.

However satisfactory DDT-synergists might be, there remains a danger that the house-flies could eventually develop resistance to the combination. To test this possibility, laboratory selection for resistance to DDT plus synergist was carried on for 5 generations, by exposing the flies to doses giving 60 to 80 per cent. kill. Selection was intensified by exposing the larvae as well as the adults to the insecticide combination. It was found that after 5 generations the resistance had increased a hundredfold. Furthermore, the flies were now also highly resistant to DDT combined with other synergistic compounds. Although it is not certain that this would occur in the field, it would appear that the use of such synergists does not offer a very hopeful solution to the problem of insecticide resistance. *J. R. Busvine*

Dresden, D. & Oppenoorth, F. J. **Residual Effect, Skin Application and Injection of γ-Hexachlorocyclohexane in** *Drosophila melanogaster*. *Bull. Entom. Res.* 1953, Jan., v. 43, Pt. 4, 581–6, 3 figs.

Methods for testing the resistance of *Drosophila melanogaster* to *gamma* BHC were investigated as a basis for future investigations on the development and nature of resistance in this species to insecticides.

The contact effect of *gamma* BHC was examined by introducing 45–55 insects into test tubes lined with filter papers which had been impregnated with the insecticide. The dead insects were counted after an exposure of 24 hours. *Gamma* BHC was applied to the ventral side of the abdomen in another series of flies by means of a constriction pipette which delivered volumes as small as 0·028 cmm. and 0·034 cmm. In another experiment emulsions of *gamma* BHC were injected into the lateral part of the thorax dorsally to the halteres. After treatment, both in the application and injection experiments the flies were collected in clean tubes and the number dead recorded after 24 hours.

When application and contact tests were repeated with one particular concentration of *gamma* BHC, greater fluctuations were found in the results than would be expected by chance. With the injection experiments there was no significant difference between the theoretical and experimental variance. The authors state that the LD_{50} after injection was only one-seventh the LD_{50} after application of the insecticide to the abdomen. It should be pointed out, however, that in one case a solution of *gamma* BHC in acetone is being used, and in the other case an emulsion of *gamma* BHC and therefore the results are not strictly comparable.

The regression line was linear in application tests and injection tests, and only departed from linearity at very low dosages in the contact test.

C. Mary Harrison

Ovazza & Taufflieb. Tabanides d'A.E.F. [**Tabanids of French Equatorial Africa**] *Bull. Inst. d'Études Centrafricaines*. (n.s.), 1952, No. 4, 131–41, 1 fig. [10 refs.]

This is a list of species of *Tabanus, Haematopota, Hippocentrum, Tabanocella* and *Chrysops* occurring in French Equatorial Africa, with notes on their geographical distribution in this territory. A map shows the recorded distribution of the three species of *Chrysops*: *C. longicornis, C. silacea* and *C. dimidiata*.

H. S. Leeson

Middlekauff, W. W. **The Horse Flies and Deer Flies of California (Diptera-Tabanidae).** *Bull. California Insect Survey*. 1950, v. 1, No. 1, 1–24, 6 figs. on pl.

This monograph gives a key to the Tabanidae of California, followed by a list of over 60 species. The list gives records of the American States where the species has been found, and detailed records, with references to findings from the State of California.

HEISCH, R. B. & GUGGISBERG, C. A. W. **Notes on the Identification of Kenya Sandflies.** *East African Med. J.* 1952, Oct., v. 29, No. 10, 423–32, 23 figs. on 12 pls.

Seventeen known and several new species (to be described elsewhere), of *Phlebotomus* are recognized in Kenya. Kala azar is reported from the Colony. The importance of sandflies may yet be shown to be considerable in the field of virus diseases. The present paper is designed to provide a systematic basis for the further study of this interesting group of flies in East Africa. The material and information available is limited almost exclusively to Kenya. The paper contains a key to female and to male flies, and short descriptions amplified by numerous line figures. *D. S. Bertram*

KIRK, R. & LEWIS, D. J. **Some Ethiopian Phlebotominae.** *Ann. Trop. Med. & Parasit.* 1952, Dec., v. 46, No. 4, 337–50, 8 figs. & 1 map. [19 refs.]

The authors continue the account of their studies on Ethiopian Phlebotominae [see this *Bulletin*, 1952, v. 49, 555]. They describe in this paper 3 more new species, namely *Phlebotomus* (*P.*) *guggisbergi* (♂ and ♀), *P.* (*Sergentomyia*) *gracilis* (♂ and ♀) and *P.* (*S.*) *blossi* (♀ only), all from Kenya, a new variety *P.* (*S.*) *bedfordi* var. *bereiri* (♀ only) from the Anglo-Egyptian Sudan and the female of a known species *P.* (*Sintonius*) *suberectus* from the Anglo-Egyptian Sudan and Kenya. The type specimens of the new species and the new variety have been deposited in the British Museum.

Certain characters used in the identification of *Phlebotomus* species are discussed, new information is given on several species, including some unpublished records and the species and varieties of *Phlebotomus* from Arabia, Eritrea, Kenya and Uganda are listed. Important morphological details are illustrated and a map is given of the Sudan and Eritrea showing the location of places mentioned in the text. *H. S. Leeson*

See also p. 399, BUNN, **Effectiveness of DDT in the Control of Body Lice in Germany.**

LE GAC, P. Contribution à l'étude des acariens des genres *Thrombicula, Schongastia* et *Schongastiella* recueillis sur les rongeurs de l'Oubangui-Chari. (A.E.F.) [**Study of** *Trombicula, Schöngastia* **and** *Schöngastiella* **Collected From Rodents in Oubangui-Chari**] *Bull. Soc. Path. Exot.* 1952, v. 45, No. 6, 747–9.

RADFORD, C. D. **Five New Species of Larval Mites (Acarina : Trombiculinae).** *Parasitology.* 1953, Jan., v. 42, Nos. 3/4, 231–8, 10 figs.

The larvae of the new species *Trombicula kalrai* and *T. plumosa* are from *Rattus* sp. in the Kumaon Hills, India, and from a squirrel (*Callosciurus pygerythrus pygerythrus*) at Imphal, India, respectively. They are remarkable for their very well developed feathered spines, or hairs, on the body. The other species, their host and locality are as follows: *Neoschöngastia covelli* (squirrel as for *T. plumosa*), *Ascoschöngastia capillata* (*Rattus* sp., Central Province, India) and *Comatacarus atollensis* (*Rattus norvegicus norvegicus*, Maldive Islands). *D. S Bertram*

ENIGK, K. & GRITTNER, I. Die Exkretion der Zecken. [**The Excretion of Ticks**] *Ztschr. f. Tropenmed. u. Parasit.* Stuttgart. 1952, Oct., v. 4, No. 1, 77–94, 7 figs. [43 refs.]

The habits and mechanism of excretion were studied in 14 species of Ixodid and 5 species of Argasid tick, with the intention of providing data for the better understanding of the transmission of *Rickettsia* and other micro-organisms in tick excreta. In the Ixodid ticks, excretion is rhythmic, and occurs only at definite points in the life-cycle. Urination is observed from the beginning of feeding to about the middle of the diapause in each developmental stage, also for a few days after moulting, while defaecation only occurs during the act of feeding, and for a few days after moulting. There are slight differences of behaviour between species. The stoppage of excretion during the later part of the diapause is attributed to the blocking of the cloaca, the muscular strength being insufficient to expel faeces formed while fasting. In the Argasid ticks, excretion is independent of the act of feeding. Less blood is taken in one meal, and the intestinal muscles are able to expel faeces at any time. In the case of *Ornithodorus moubata* there is never any open connexion between the hind-gut and the rectal vesicle. The illustrations are in the form of photo-micrographs of sections through the excretory organs. *A. J. P. Goodchild*

HEISCH, R. B. & GUGGISBERG, C. A. W. **On *Ornithodoros graingeri* n. sp., a Tick from Caves in Kenya.** *Parasitology.* 1953, Jan., v. 42, Nos. 3/4, 192–8, 19 figs.

The ticks here described for the first time were taken in April 1950, just below, or crawling on the surface of, the fine brown earth on the floor of two coral caves a few hundred yards from the sea near Dinai, about 20 miles south of Mombasa. Descriptions are given, with excellent line figures, of the adult female and male, the larva, and the first to fourth nymphs. No ticks were found on bats (*Rhinolophys* and *Megaderma* sp.) in the caves ; the ticks were found only on the floor. Porcupine quills occurred in the cave and these animals may be hosts. *D. S. Bertram*

COCHRAN, D. G., GRAYSON, J. M. & LEVITAN, M. **Chromosomal and Cytoplasmic Factors in Transmission of DDT Resistance in the German Cockroach.** *J. Econom. Entom.* 1952, Dec., v. 45, No. 6, 997–1001, 3 figs. [19 refs.]

SCHULZE, Faith, SWEETMAN, H. L. & SPEAR, P. J. **Toxicity of Lindane Vapor to Tropical Fish.** *J. Econom. Entom.* 1952, Dec., v. 45, No. 6, 1094–7.

LABORATORY PROCEDURES

MAKARI, J. G. **The Health Index—a Test for the Assessment of Adequate and Inadequate Health of a Community.** *J. Trop. Med. & Hyg.* 1953, Jan., v. 56, No. 1, 4–12, 3 figs. [12 refs.]

The data on which this study was based related to employees or prospective employees, aged 19 to 48, of the Arabian American Oil Company at Saudi Arabia. Modifications in the reading and recording of the serial cephalin flocculation test were made to form a health index based on 4 factors, *viz.*, the quantitative and qualitative flocculatory factors and the quantitative and qualitative inhibiting factors. The results obtained from two control groups,

44 American and 33 Palestinians who were negative to all laboratory tests, and a group of 225 Palestinians who gave a positive reaction to the laboratory tests, were compared.

The means of the 4 components of the health index did not differ between the American and Palestinian controls but the variances differed significantly. The means of one or more of the factors of the health index for the American controls differed significantly from the means of the group of Palestinians with *Ascaris* alone or with *Ascaris* combined with either protozoa or other helminths or both. Palestinians infested with *Taenia* had a mean quantitative flocculation factor significantly greater than the American controls. The means of the groups infested with *Entamoeba coli, Entamoeba histolytica* or *Trichuris* alone did not differ significantly from the controls but there was a significant difference for the group infected with both *Trichuris* and *Entamoeba coli*. Palestinians with positive X-ray for tuberculosis, and infestation, and those with albumin in the urine and infestation, differed significantly from the controls in the mean of one of the factors.

The author suggests that his method could be applied in surveys of the community to detect regions where investigation was necessary. Owing to the large variation around the mean that occurs for each of the 4 factors this health index cannot be used to discriminate between infested and non-infested individuals. *W. J. Martin*

REPORTS, SURVEYS AND MISCELLANEOUS PAPERS

STRODE, G. K., WHAYNE, T. F., WILLIAMS, L. L., Jr., SAPERO, J. J. & SNYDER, J. C. **Health Hints for the Tropics.** (Revised Nov. 1951 by Cttee. on Trop. Med. & World Health, Amer. Soc. Trop. Med.) *Suppl. to Trop. Med. & Hyg. News.* [1952.] 23 pp. [19 refs.] Bethesda 14, Md.; National Institutes of Health.

The provision of advice on preservation of health in the tropics is an important contribution to the safety of the migrant from temperate areas. The Health Hints under review are produced by very distinguished authors with wide knowledge who worked as a Committee of the American Society of Tropical Medicine, which Society undertakes the general distribution of the pamphlet except that the American Foundation for Tropical Medicine distributes it to industrial concerns.

After a common-sense introduction health is considered under the headings : climate ; water ; food ; insects and insect vectors of disease ; immunization ; miscellaneous hints, and mental health in the tropics. The last section has been added since the previous edition and provides an excellent statement of the need for adjustment on leaving one's home town, whether for tropical or other destinations, and of the way to set about that adjustment. This section might well be brought forward to an earlier place.

The other sections are sound and convey sensible advice which can be readily understood. The reviewer feels that the over-cautious individual might gain too much support for his attitude to reading parts of it. He is advised to stay indoors in screened buildings after nightfall ; though told to take mild exercise he might well interpret the injunction to take occasional salt "if exercise or physical labour are necessary" as a warning against any more than very mild exercise. Similarly the suggestion that a sun helmet protects against sunstroke could well revive old fears. These are, however, minor points in an excellent pamphlet, one of the best features of which is the section on immunization. The hints can be thoroughly recommended to intending visitors to the tropics. *G. Macdonald*

DUBOIS, A. Le développement de la médecine expérimentale au Congo Belge. [**The Development of Experimental Medicine in the Belgian Congo**] Reprinted from *Deuxième Rapport Annuel de l'I.R.S.A.C.* [Institut pour la Recherche Scientifique en Afrique Centrale.] 1949, 82–147, 1 chart & 12 pls. [Numerous refs.]

Dr. Dubois presents a review of experimental medicine in the Belgian Congo from 1894 to 1949 as a background on which the policy of the newly founded I.R.S.A.C. (*Institut pour la Recherche Scientifique en Afrique Centrale*) in medical and para-medical fields can be logically considered. The review is scholarly and at the same time well presented and very readable. It constitutes a major contribution to the history of tropical medicine in general as well as of happenings in the Congo and in Belgium.

The history starts with the foundation of a laboratory in Leopoldville in 1894 ; the initiative was that of King Leopold II, the first Director was DE MARBAIX, and its finance was partly governmental but to a considerable extent from private benefaction. De Marbaix, like many of his successors, died shortly after taking up his post, and the early years are marked by the deaths of several young men who lived just long enough to establish their brilliance. The laboratory grew and through its successive growths was the predecessor of the Princess Astrid Institute of Tropical Medicine established in Leopoldville in 1937. Its work changed in character with the passage of time : originally it was concerned largely with malaria, blackwater fever, filariasis and diseases of the European. About 1900 a strong interest in sleeping sickness began to develop and resulted in the numerous studies which are well known and some of which were summarized in a Chadwick Lecture by VAN HOOF [this *Bulletin*, 1947, v. 44, 1048].

About 1920 the work of the laboratory became diversified with the formation of separate departments and initiation of studies on a wider range of subjects than hitherto handled, while after 1930 the growing demand for diagnostic work led to further extension and the development of associated institutions. Among these the Stanleyville laboratory concentrated on parasitology ; that at Coquilhatville worked primarily on rickettsioses, and that at Blukwa on plague. Industrial, Red Cross and missionary laboratories have also grown during the latter period.

Scientific expeditions and missions which have visited the Congo are described but are too numerous to mention. Of particular interest among them is the first, directed by DU BOURG DE BOZAS in 1901, which included a young doctor later to become world famous—E. BRUMPT. In the early years of this century there was a close association with the Liverpool School of Tropical Medicine which despatched the mission of DUTTON, TODD and CHRISTY, thereby leading to the making of medical history and the tragic death of Dutton. The work of these early missions led to a realization of the need for special training in tropical medicine, and thus to the foundation in Brussels of the School of Tropical Medicine in 1906 as a fore-runner of the present Institute of Tropical Medicine in Antwerp which came into being in 1933. The Belgian Society of Tropical Medicine was also founded through the initiative of one of the pioneers of the Congo—BRODEN—in 1920.

The author expounds a healthy philosophy of physiology and medicine in the African, firmly rejecting the mystical belief that there is some inherent difference between the European and African, considering that physiology and pathology in the two are essentially the same though differences of environment and descent may have created minor differences. He pleads for the rational study of the African on the lines which have been followed in the case of the European, and shows in a series of sections the preliminary development of

such studies. They recount work on entomology and physiology, malaria, trypanosomiasis, amoebiasis, rickettsiosis, schistosomiasis, spirochaetosis, leprosy, plague, mycosis, climatic diseases, avitaminosis, and other diseases. From them he develops his philosophy of a cosmopolitan pathology.

Original pure scientific research led to practical developments in the application of hygiene and social medicine to the African which, in turn, required the training of Africans for technical work. Starting on a small scale it has grown considerably and high technical standards are reached.

Research on arthropod vectors of disease and snails is listed separately. It naturally concerns itself particularly with researches on the tsetse fly but includes considerable work on mosquitoes, *Simulium*, *Culicoides*, and on ticks.

I.R.S.A.C. has been assigned the task of developing all forms of scientific research but most particularly those which have in the past been neglected for various reasons. The review shows that the study of medicine has not been neglected but, on the contrary, has had a healthy growth. Medical research is, however, becoming vastly more complicated than it has been in the past, now demanding the work of teams and institutions such as have found no previous place in the Congo, and some of these more elaborate lines could well be developed by I.R.S.A.C. The author also notes the relative lack of work on anatomy, physiology and pathology, which subjects could well be encouraged by I.R.S.A.C. There is thus a great field for the latter, which can act as a catalyst to scientific work in general and to all researches.

The review closes with a bibliography of the major publications from the Congo and is illustrated by photographs ranging in time from the earliest days to the most recent developments.

[The reviewer owes and offers a sincere apology for the great delay in the production of this review.] *G. Macdonald*

ANDREWS, W. H. H. & MAEGRAITH, B. G. **Anatomical and Physiological Evidence of Anastomosis of the Hepatic Artery and Hepatic Vein within the Mammalian Liver.** [Correspondence.] *Nature*. 1953, Jan. 31, v. 171, 222–3, 1 fig.

Despite many studies of the anatomy of the intra-hepatic circulation in mammalia, the evidence for the existence of direct anastomoses between its afferent and efferent vessels is lacking. Owing, however, to the erratic and frequently unpredictable responses of the hepatic vessels to injections of acetyl choline or adrenaline, the presence of such anastomotic vessels has long been suspected. Andrews and Maegraith now claim to be able to demonstrate such anastomoses in rats, rabbits and guineapigs, the vessels constituting a direct passage between branches of the hepatic artery in the portal tracts and the sublobular veins.

The modification of the usual perfusion techniques which revealed the existence of these vessels was the preliminary obstruction of the intra-hepatic portal venous system by a saline suspension of kieselguhr. The hepatic artery was then perfused with " Hycar " latex at a pressure of about 200 mm. mercury, followed by retrograde perfusion of the hepatic veins by coloured neoprene at a pressure of 30 mm. of mercury and subsequent removal of the parenchyma by digestion in strong hydrochloric acid. Previous failure to inject these vessels must, in view of these results, be attributed to retrograde diversion of the injection mass from the hepatic artery into the portal venous system by way of the numerous ladder-like communications between the branches of the hepatic artery and the portal vein, already described by WAKIM and MANN (*Anat. Rec.*, 1942, v. 82, 233). The preliminary injection of kieselguhr presumably blocks this alternative pathway, and thus compels the " Hycar "

latex to enter the arterio-venous anastomoses. As the vessels now described by Andrews and Maegraith are only of arteriolar size the former difficulty of injecting them is easily understood.

[This work relates to the investigations carried out previously on anoxia of the liver, one of the causes of which is malaria, see this *Bulletin*, 1952, v. 49, 111, 662.] *L. E. Glynn*

BOOK REVIEW

CAULLERY, Maurice. **Parasitism and Symbiosis.** [Translated by Averil M. LYSAGHT (M.Sc., Ph.D.).] pp. xii+340, 80 figs. 1952. London: Sidgwick & Jackson Ltd. [35s.]

Since the publication of the first edition of Prof. Caullery's well-known monograph 30 years have elapsed, during which our knowledge of parasitology has advanced considerably. A revision was thus overdue, and the appearance, in 1950, of the second French edition, and of the present English translation, is therefore welcome.

Though this book is intended primarily for biologists, it will be of interest to medical men as well, by providing a wider background, against which medical parasitology can be viewed in true perspective among the diverse associations of living organisms.

Since there are no hard and fast lines separating commensalism, parasitism and symbiosis, these associations are treated from the evolutionary point of view. The first two chapters are devoted to commensalism in marine and terrestrial animals, after which the transition to parasitism, *via* inquilinism (where one animal lives within another without feeding entirely at its expense) is described. The chapters on parasitism deal with adaptations to parasitism among different groups of animal-hosts, digenetic life-cycles, host-parasite relations, host-restriction, and transmission. Finally, an account is given of symbiosis in animals and plants. *C. A. Hoare*

Printed in Great Britain under the authority of HER MAJESTY'S STATIONERY OFFICE
by The South Essex Recorders, Ltd., Ilford.
(265) Wt. P8/418 6/53 S.E.R. Ltd. Gp. 432